March 1969

Railway Signaling & Communications

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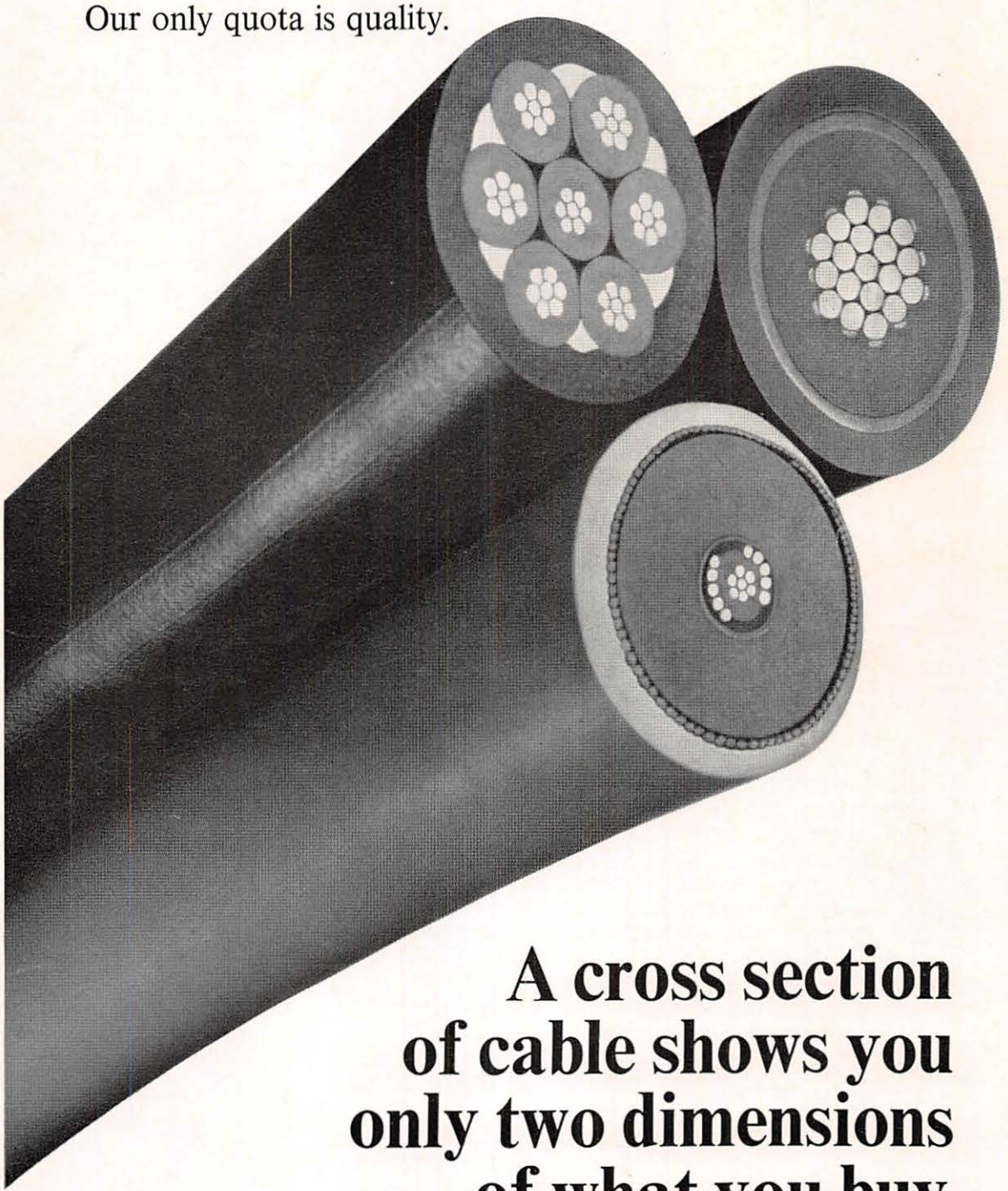

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Circle 1 on reader service card on page 38

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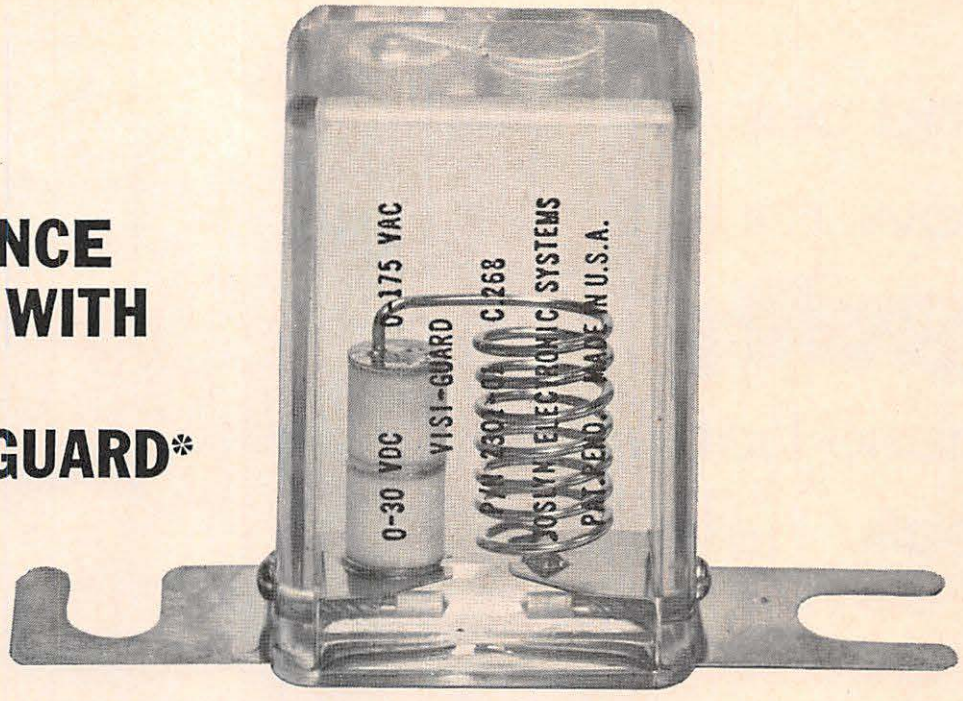

How much time and money, maintenance-wise, do false restrictive failures due to transients in the electronics cost you? Chances are, plenty! Worse yet, the problem they cause for you is compounded when you factor in the cost of disrupted schedules.

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Complete specs available in VSMF, Visual Search Microfilm File

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with any signal storage battery you are now using

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Editor's Corner

There's only nine months left till all cars interchanged on American railroads will be equipped with automatic car identification labels. To be able to use ACI data, most railroads are studying to determine ACI scanner locations. On at least two roads, industrial engineers have been given this assignment. On another road, the signal engineer has the ACI location study to make. He has assigned one of his engineers to make on-the-spot investigations with operating department men. On this road, it has been determined that the operating department will be the immediate user of ACI generated data. On other railroads, the communications department will make the ACI scanner location studies.

Regardless of who makes the study, it appears that either signal or communications men may install and maintain the scanners. Indications are that scanners may be leased, and also a maintenance contract provided by the manufacturers or by a third party, such as a leasing company.

The signal department on one railroad is handling ACI scanners because they are wayside devices which can be installed and maintained by signal maintenance forces. Also, it is felt to be a logical move because signal maintainers are located along the system, each responsible for a particular territory.

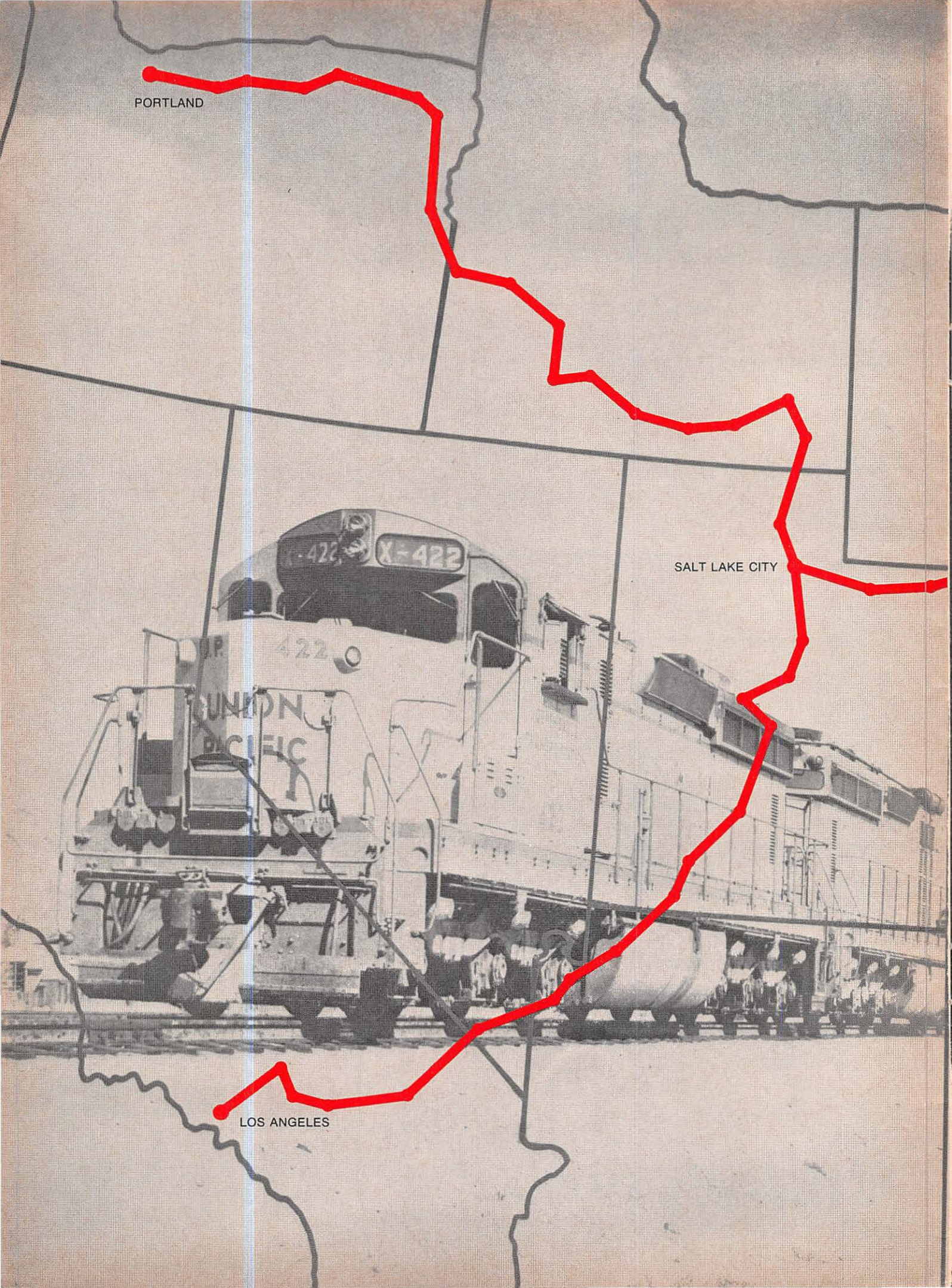
Reasoning that an ACI scanner is an electronic communications input device, many railroads are assigning ACI scanners to the communications department. On these roads, the communications maintainers may handle maintenance or not, depending upon a decision to train personnel or to obtain maintenance on a contract basis from an outside firm.

Some railroads are planning to make test installations of ACI scanners, possibly bracketing a major yard, to determine operating results, before embarking on a system-wide installation project.

ACI maybe similar to a large classification yard project where a study group made up of members from engineering, signals and communications, mechanical, operating, and data processing (and possibly traffic), work together to produce the best yard for the railroad. Here again is an opportunity for the signal and communications officers to actively participate with others in a project that directly affects S&C departments.

Bob McKnight

P.S. Don't forget to plan to attend the annual meeting of the Communication & Signal Section, AAR, at Montreal, Que., Sept. 16-18, 1969.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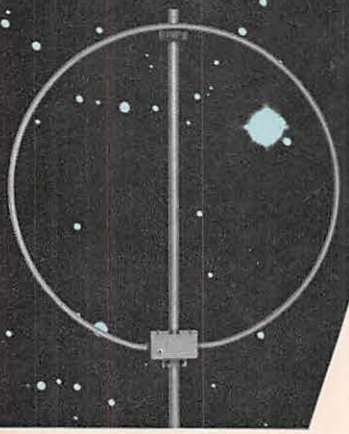

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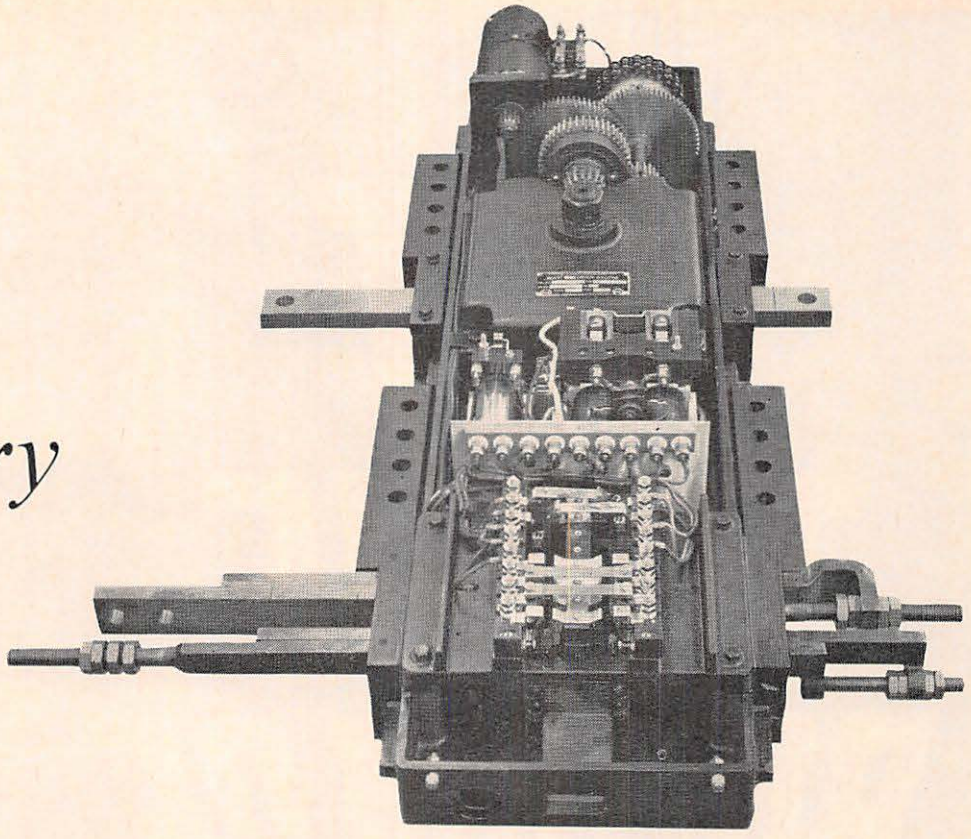
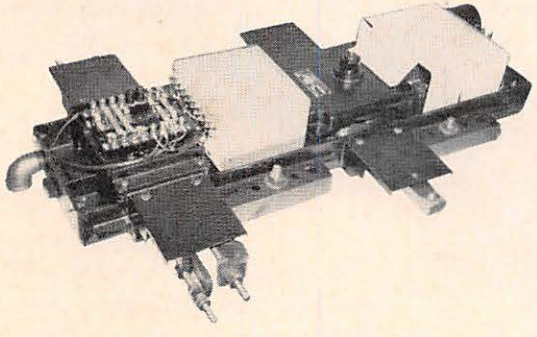
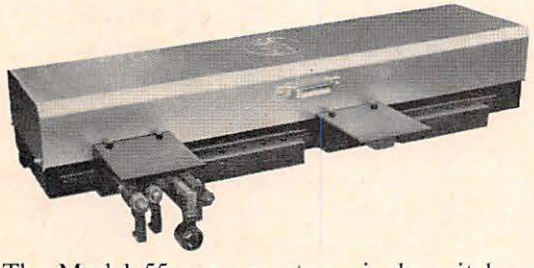
The Inside Story



on the GRS Model 55 Electric Switch Machine



Lock and detector rods are single, double-adjustable with renewable, one-piece, box-style wear plates.



The Model 55 can operate a single switch, a double-slip switch with a continuous front rod, or any type derail in mainline or rapid transit service.

Weighs only 520 pounds (other machines weigh up to half a ton). The motor, for example, weighs only 12½ pounds, is only 4 inches in diameter, yet turns out ½ hp.

Lubricates in seconds—only four gear faces and four sliding surfaces. No grease gun needed.

Major assemblies—point-detector, motor, main gear, intermediate gears—easily removed for inspection and/or replacement.

One-piece, deep-sided cover (aluminum for lightness and corrosion resistance) removes in seconds to fully expose internal assemblies.

The Model 55 can be used as a direct replacement for the Models 5C, 5E, and 5G machines. It also replaces the Model 5 rapid transit machine (with minor changes in layout). For the complete story, contact your GRS sales representative.

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we have had skeletons in our closet!!!

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Put your stations on the wagon.

Maintenance calls cost money, lots of it. Take water, for instance. By the time your crews make their rounds adding water to your communications batteries, you could be paying $40.00 a pint . . . or more.

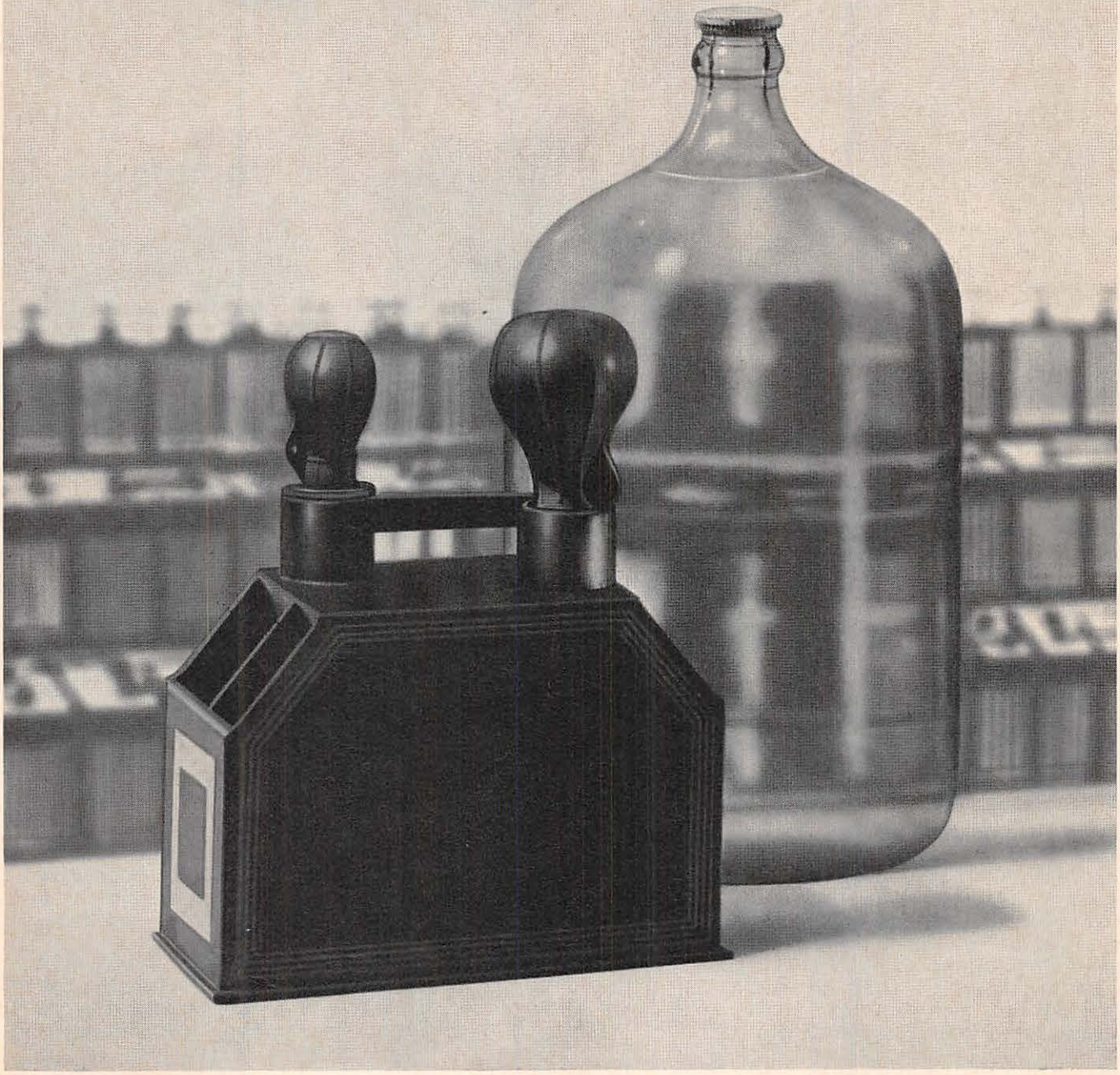
That's why economy-minded companies install C & D lead calcium batteries and make one battery maintenance call a year.

Their crews only have to add water once every three years, or so, as compared with 6 to 12 times each year for conventional antimony types.

What's more, equalizing charges are eliminated. C & D lead calcium batteries never need one if kept on the proper float charge, but antimony types average one equalizing charge a month. Antimony batteries may also require a check charge at least 6 times a year. But there's never a check charge with C & D calcium types.

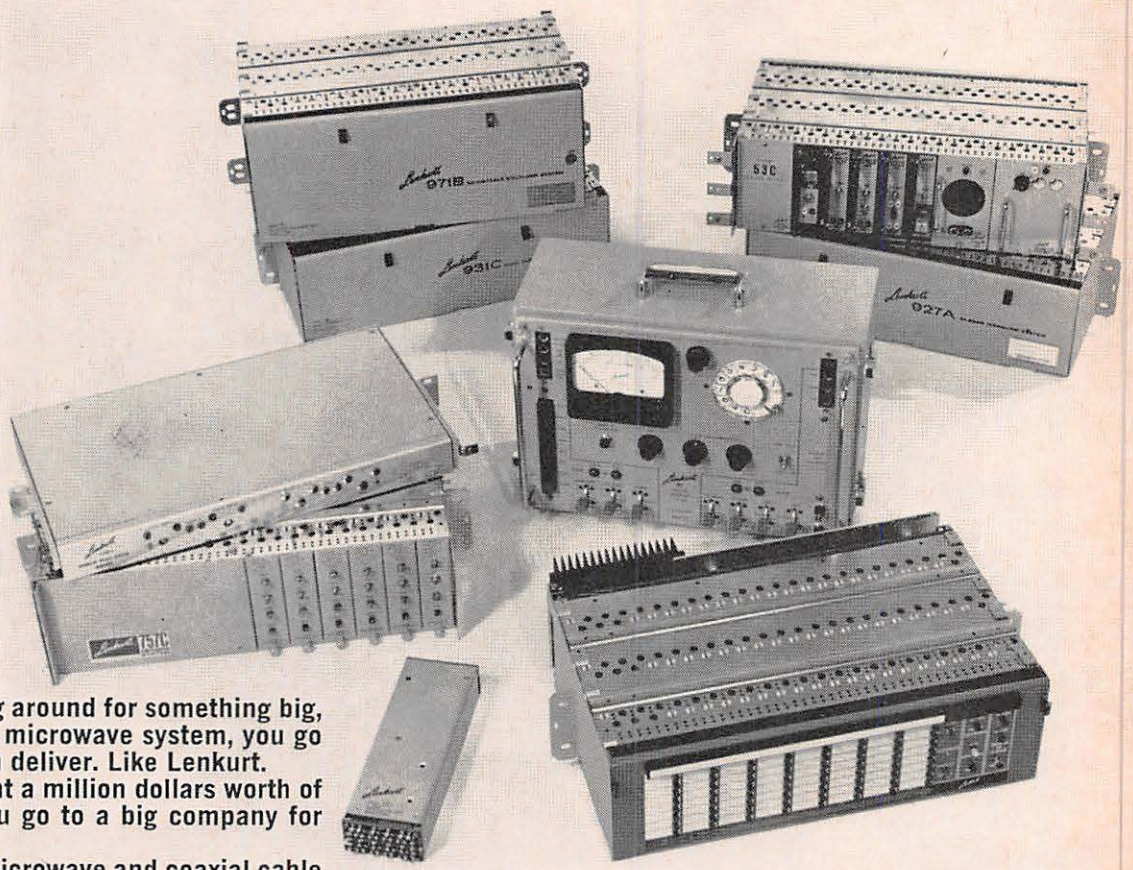
If you can't spare $40.00 for a pint of water, spare a few minutes to get the maintenance saving facts. Write to C & D Batteries, Conshohocken, Pa. 19428.

C&D BATTERIES
DIVISION OF ELTRA CORPORATION
Washington & Cherry Streets, Conshohocken, Pa. 19428



Circle 8 on reader service card on page 38

These could be the end of something big.



When you're shopping around for something big, like a multi-million dollar microwave system, you go to a big company that can deliver. Like Lenkurt.

And any time you want a million dollars worth of cable carrier systems, you go to a big company for that, too. Like Lenkurt.

And when you want microwave and coaxial cable and multiplex and cable carrier and data transmission, you definitely go to Lenkurt. Because we're the only company that makes them all.

With all the big things we do, it isn't surprising that sometimes our small-ticket items, like accessories, get overshadowed.

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Or adjustable equalizers? Lenkurt again.

Or echo suppressors? Order wire? A microwave path protection system? A signaling system and a signaling test set? A status monitoring and alarm system? We have them all.

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GOULD NATIONAL BATTERY POWER

Circle 14 on reader service card on page 38

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The "System" to give your system years-ahead communication and signaling flexibility, dependably, is CCS. It's backed by 15 years' research and operation experience. For more information, write for the CCS brochure. Or, call Serge Elian, Director of Marketing, (617) 547-9000.

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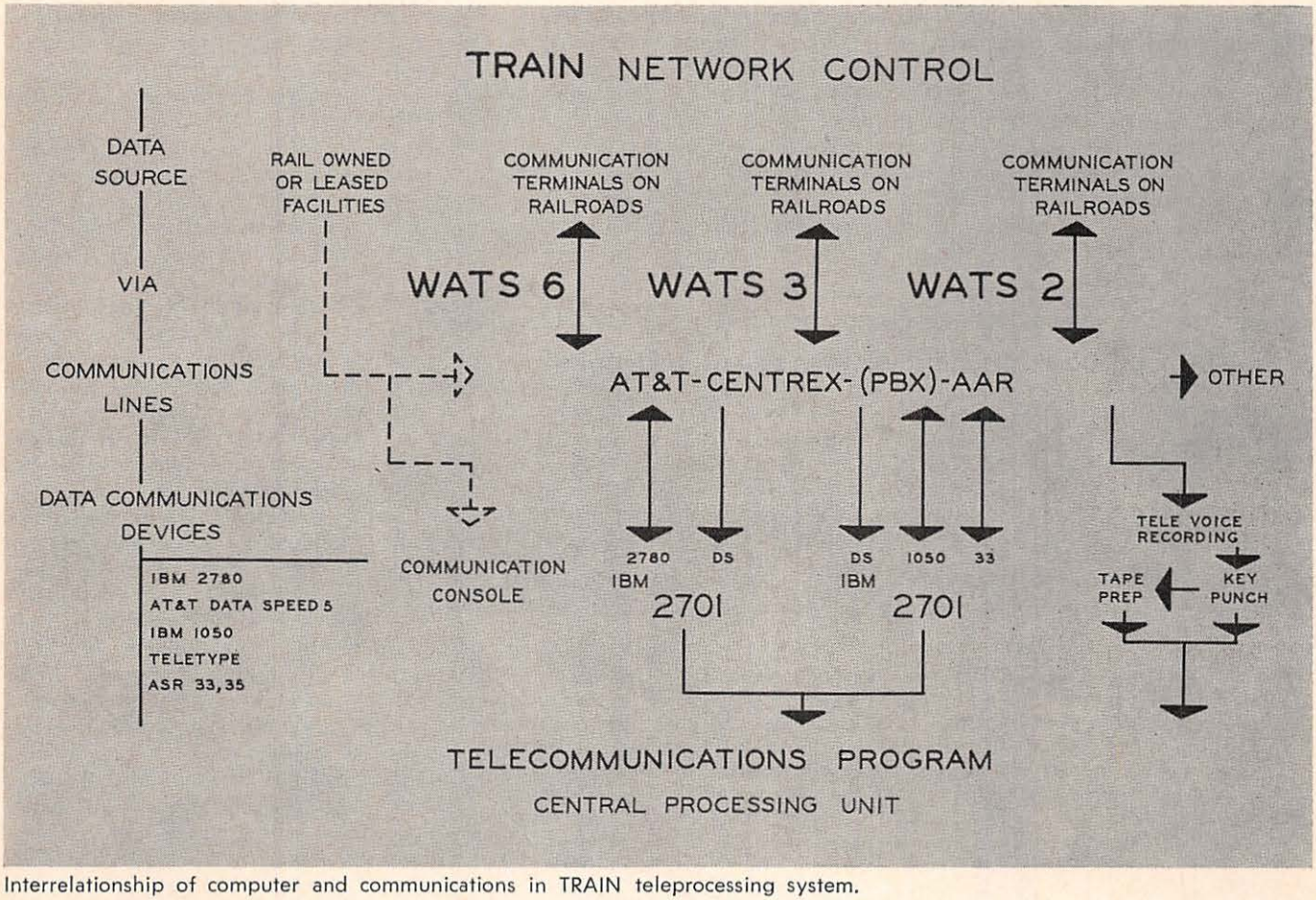


Interrelationship of computer and communications in TRAIN teleprocessing system.

RAILWAY CYBERNETICS:

TRAIN project gets underway

Very shortly, at least two railroads will be sending data on cars delivered in interchange to the AAR's Washington headquarters. This will be the initial phase of testing for the TeleRail Automated Information Network.

This information network is designed to provide timely, accurate and complete car information to "enable the Car Service Division of the AAR to more effectively fulfill its role in balancing and allocating the national car fleet with respect to shipping demands," says R. B. Curry, vice-president, management systems department, AAR.

Heart of the TRAIN system is an IBM 360 model 40 computer with transmission control units, disk files and associated hardware including input/output equipment. Using three AT&T's WATS (Wide Area Telephone Service) lines, the computer will dial each of the 65 participating railroads on a sequential basis 24 hours daily, seven days per week. Four types of data transmission terminals will be used by the roads and at AAR's TRAIN headquarters:

- For low volumes (roads reporting less than 1,000 cars daily in interchange), equipment will be Teletype model ASR 33 or IBM 1050 units.
- For high volumes (roads reporting over 1,000 cars daily in interchange), terminal units will be AT&T's Data Speed 5 or IBM 2780 units.

Two-way communication is available. A road can have interchange information in its terminal unit for transmission to Washington. Also, it can have an inquiry for TRAIN ready for sending.

All Class 1 roads will report interchange delivered and also interchange received from Class 2 roads and switching and terminal companies. The information will include the interchange report containing the date, time, place

and the two railroads involved in the interchange, and a car record for each car involved in the movement. A summary record will follow, indicating a count of the cars covered by the interchange report.

The national railroad data center portion of TRAIN, the computer complex, will process this information daily. Any corrections will be requested via the WATS lines and roads will transmit these corrections when polled by the computer. Correction and inquiry messages will be handled separately from the interchange reports. This interchange information will be posted daily to a car location master file. This file will contain a record for each of the approximately 2.1 million Mexican, Canadian and U.S. freight cars recorded in UMLER (Universal Machine Language Equipment Register). Each record will contain data covering the latest four interchanges of the car. The file will be augmented by a history file, which will reflect all the movements of the cars during a given month.

Three basic car service reports prepared by the TRAIN system include: (1) CS-8A is a weekly summary of car locations by railroad and type of car. (This is a compilation of the present CS-11 reports from all Class 1 roads). (2) Monthly CS-10 report is a summary of foreign cars on line by car ownership and type of car. Each Class 1 road will receive a CS-10 report only for cars on its own line. (3) The monthly CS-10A report is a summary by car type of the location road for each Class 1 road's car ownership.

TRAIN will report back to railroads, either on a request basis or on a regular schedule:

- To notify the car-owning road of equipment interchange between foreign lines to ultimately eliminate the junction slip procedure and for resolution of open per diem records.
- To advise on request of the car-owning roads as to the location of their cars on foreign lines by type of car, by series of car numbers, by individual cars and by category of special equipment.
- To respond to inquiries by car-owning roads on location and/or utilization of cars assigned to pools.
- To provide inventory of cars, system and foreign on-line in summary form and inventory of system cars off-line by location and times by car types and by foreign ownership.
- To provide TRAIN reports affecting individual roads including present and future car service reports and gateway flow statistics.

"Disclosure of information on railroad interchange of freight cars will be limited to authorized personnel of the AAR and to others only on the basis of proprietary and respective interests under its guidelines of (1) car owning roads, and (2) roads originating loads," says AAR's Curry. Because TRAIN is a secondary source based upon railroads' primary sources, it is felt that it will not be of significant assistance to shippers in car locations to warrant their access to the data. Their interest is more than a road-by-road location says Curry. Consequently, there is no provision in implementation of TRAIN for access to information by shippers.

During the day, the TRAIN computer will be dialing around picking up information from the railroads. Anticipated loadings of the three outward WATS lines indicate the dial-up intervals to each railroad will range from 15 minutes to an hour.

On a once-daily basis, probably about midnight or 1 a.m., the system will take the received data and set up for immediate processing. "The data will go through several very extensive edits," reports Mitchell A. Morris, director, systems development division, management services department. "Interchange reports which do not pass the edit and all cars relating thereto will be put into a suspense file and a message prepared for subsequent transmission to the sending railroads. Those interchange reports and car records which were satisfactory are passed on to the update program. During this up-

TRAIN computer has high or low speed I/O units

Economic studies were made to determine the types of data communications terminals that could be used in the TRAIN system to handle the varying volumes of data with reasonable costs. Four types of data terminals are planned for TRAIN and for use by roads participating in the TRAIN project. Low volume roads or those delivering less than 1,000 cars per day in interchange can select either Teletype ASR 33 or IBM 1050 units. High volume roads, over 1,000 cars daily, can choose either AT&T's Data Speed 5 or the IBM 2780.

Interestingly, studies of reporting transmission volumes indicated that while 24 railroads reported 1,000 cars of less daily in interchange, 19 roads reported over 3,000 cars daily. These 19 high-volume roads transmitted over 330,000 words daily, while the 24 roads transmitted only 29,000 words daily. Studying the volume of transmissions by the day and time of day, it was found that Friday would peak to 10% over the daily average, and that on a daily basis, the day's traffic volume peaked at about 10 a.m. Eastern time.

For communications to railroads' data processing headquarters, the TRAIN system will use outward WATS, Zones 2, 3 and 6. Line loading is anticipated to be 30 hours total, which should mean about 10 hours on each line per day. The TRAIN computer will dial out to all roads on a sequential basis, continuously, 24 hours daily, 7 days per week.

DATA TERMINAL CHARACTERISTICS

Teletype ASR 33 or the heavy-duty ASR 35 have typewriter keyboards with printed and punched paper tape outputs. The ASR 33 uses the American Standard Code for Information Interchange (ASCII) and has no error detection. It has a rated speed of 100 words per minute. Cost is about $100 per month for the ASR 33.

The IBM 1050 terminal transmits from punched cards or punched paper tape at a speed of about 150 words per minute. Code is STTTC or DDCT. Error checking and automatic retransmission are provided. Printed output is an optional feature. IBM 1050 costs vary according to the options selected but can run as much as $350 per month.

AT&T's Data Speed 5 is a punched paper tape device which uses ASCII, 5-level or 6-level code for transmission. Rated speed is about 750 words per minute. It has no error checking nor printed output capability. Data Speed 5 rents for about $250 per month.

The IBM 2780 is a card terminal permitting the choice of transmission codes such as ASCII, EBCDIC or a six-bit transcode. Rated speed is about 1500 words per minute or about 75 cards per minute, but actual transmission speed is dependent on the card blocking factor (how much data on a card and where located). Printed copy and punched card output are optional features.

The 2780 has error checking and automatic retransmission. Rental charges range from $750 to $1,300 monthly depending on options.

The TRAIN project computer center will have one each of these transmission devices for back-up and testing purposes.

The original AAR study group for the TRAIN project recommended that "The AAR should pay the cost of transmission lines, rental on paper tape transmitters on railroad property and the costs of the data center (in Washington) with all costs to be apportioned to roads under the present formula," reports R. R. Manion, vice-president, Operations and Maintenance Department, AAR. Since this original recommendation, it has been decided "that the individual roads will pay the equipment costs of receiving equipment, over and above the cost of the paper tape transmitters," Curry says.

date process, we perform further edits to be sure that we have no records for the cars referenced and that movements are logical with the moves previously reported on the cars. Any items found violating the edit rules during the update are combined with the items found during the preliminary edits and prepared for transmission back to the field."

A master file record will contain space for the last four interchanges per car. This will be supplemented, says Morris, by a back-up file to keep all moves on any given car for any given month. During the updating cycle, a variety of input data quality statistics will be developed for use in monitoring the TRAIN system and may well alert Morris and his staff in time to prevent major problems from occurring.

After preliminary contacts with some railroads, TRAIN personnel and a representative of the Car Service Division will call on all railroads by July 1, 1969. The reasons, of course, are to obtain the best possible cooperation between roads and the TRAIN project. Richard E. Shelgren, director, information processing division, management services department, AAR, explained it this way at a recent Data System Division meeting.

COOPERATION NEEDED

"Although there are many benefits which the railroads can derive from TRAIN, our primary customer will be the Car Service Division. We ask that your transportation people participate in our contact meetings to insure they are aware of TRAIN objectives and thus will have confidence in TRAIN output and will be willing to accept CSD directives which will be based on TRAIN data.

"Our liaison with the railroad will determine the type of device (communications terminal) to be ordered, distribution of formats, procedures and the necessary operational manuals. Training arrangements will be made. The importance of the railroads part in the collection and preparation of accurate and timely data must be emphasized. Thus the individual railroads have a commitment to TRAIN.

"The collection and formatting of interchange data will require a systems design and programming effort on most roads. Of course, this must be completed if we hope to make the January 1, 1970 date.

"Additional subjects for discussion at these contact meetings include determination of the road's TRAIN representative, development of the interchange point table, transmission of Car Service reports, and where necessary improved UMLER reporting," Shelgren says. Also he emphasizes that roads must follow the proper formats for transmission of data. Experience with per diem and UMLER indicate that for the TRAIN system all must understand the formatting rules and make sure that the rules are followed. "We are aware that proper training is going to play an important part in the success of TRAIN and are planning to furnish the necessary help in this area," Shelgren says.

It will be a busy 1969 for railroad systems, communications and data processing personnel, considering that TRAIN is to be operational by Jan. 1, 1970. In brief, here's what has to be done to make TRAIN operational on that January day, only about 10 months from now: Contact roads; select communications terminals; distribute formats and procedures; conduct training; maintain liaison with railroad transportation and data systems people; accept data; and analyze data.

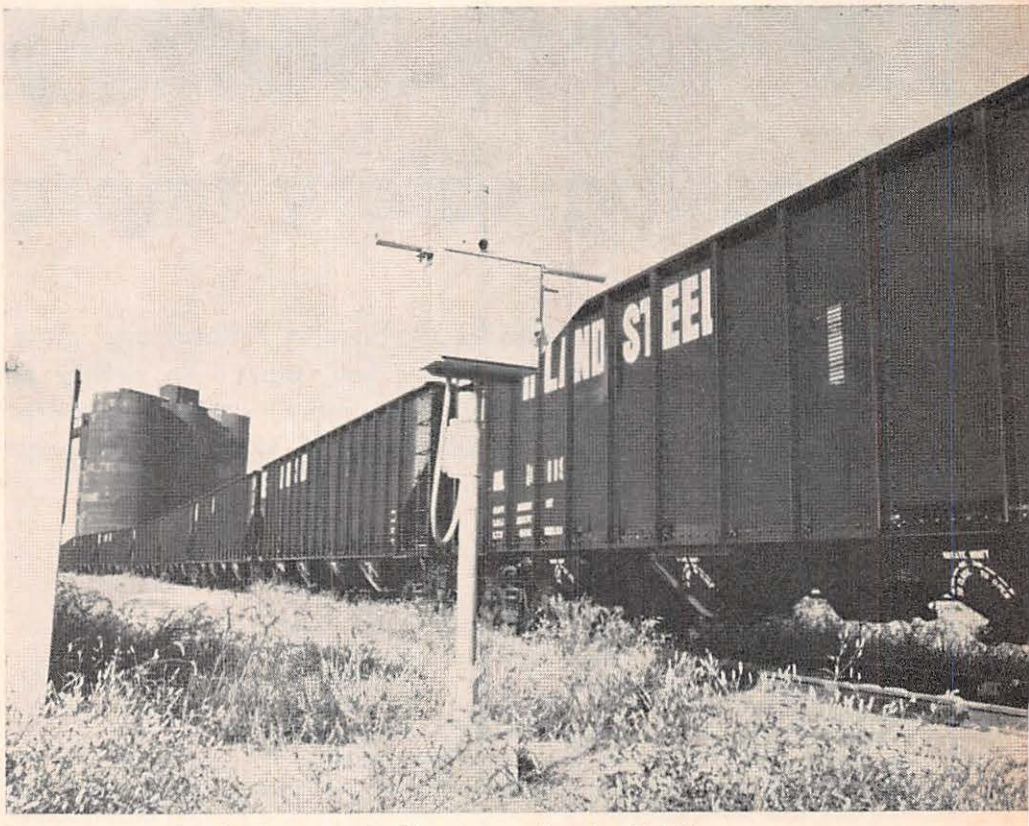
Four types of data terminals for TRAIN

TRAIN communications and data processing requirements will be handled by an IBM 360 model 40 computer with a 256 K core memory central processing unit and two 2701 data transmission control units capable of handling data sent from railroads at speeds ranging from 100 words per minute teletypewriter to 1500 words per minute from a punched-card transmission device.

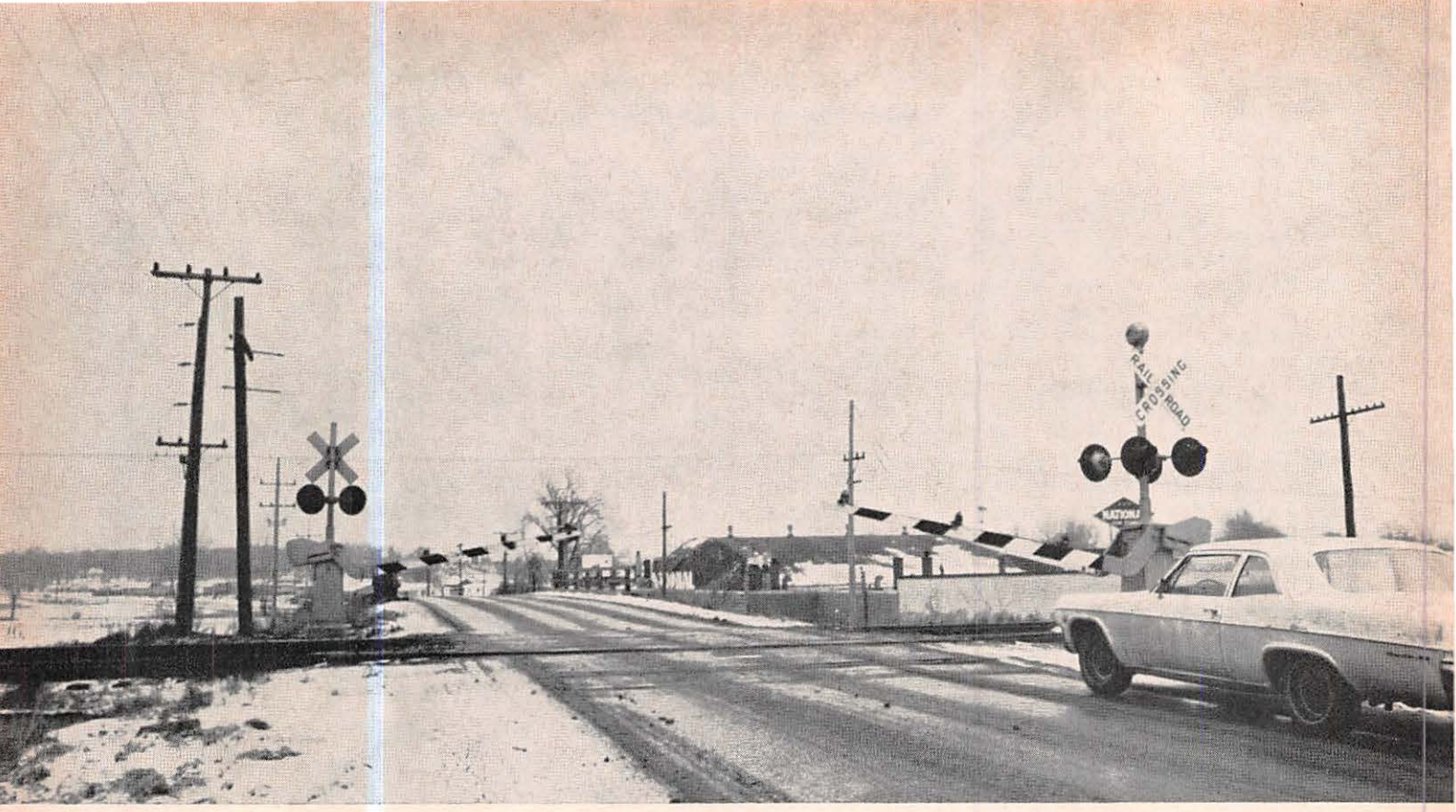
Peripheral equipment includes an 1100-line-per-minute printer, a card reader punch with 1,000-cards-per-minute reading and 300-cards-per-minute punching capability, a 600-cards-per-minute auxiliary card reader and the 1052 typewriter console. These so-called low speed input/output devices and the data transmission control units are linked to the multiplexor channel.

Connected to the two selector channels are the high-speed I/O devices. These include three 2311 disk drives (7.25 million positions); a 2314 mass storage device, having a capacity of 233 million bytes of information which will hold the master car-location file; and six 60KB magnetic tape drives. Initially, there will be no back-up system.

At least four cathode ray tube display terminals will be provided for the car service division—one each for the chairman, manager of closed cars and manager of open top cars and one for joint use of the managers' assistants. Probably another CRT display terminal will be provided for the management systems department. These CRT terminals will be able to access the computer to obtain car location information (that is, interchange information).



Automatic car identification can provide accurate data for TRAIN.



Crossing safety improves

First part of a two-part series deals with federal and state aid to railroads and communities for improving safety at rail-highway grade crossings. Next month's article reports on a recent Rail-Highway Grade Crossing Safety Conference at the University of Illinois.

Much has been done in recent years to improve safety at rail-highway grade crossings. And much credit can be given to Committee D—Highway Grade Crossing Protection, Communication & Signal Section, AAR. From the 1968 report to the C&S Section in its annual meeting, Committee D reported on various facets of federal and state aid to railroads and communities for improving safety at grade crossings. Material from that report is abstracted herewith.*

The Federal Highway Administration "Safety Spot Improvement" program was instituted to make a substantial contribution to reduce accidents at railroad-highway crossings.

Information was released Dec. 21, 1967 advising that since the spot improvement program was inaugurated in 1964, states have programmed 576 projects to enhance safety at railroad-highway grade crossings throughout the nation. The total cost of these improvements is estimated at $33,530,000 with the federal share fixed at $21,711,000.

Automatic protective devices were installed at 458 crossings at a total cost of $6,990,685 with an average cost of $15,264. At 77 crossings, the grade crossing was eliminated by construction of an overpass or an underpass at a total cost of $24,123,692. The average cost of these elimination structures was $313,295. At five locations, the highways were realigned to eliminate the grade crossing. Such work totaled $822,674, with the average cost being $164,535. Other types of improvements such as installing better signs, cutting brush and upgrading pavements at crossings, were undertaken at 36 rail-highway grade crossings. Total cost was $1,592,779, with the average cost being $44,244.

The grade crossing projects amount to 17.3% of all safety spot improvements programmed and represent 5.6% of the cost. The average cost per project is $58,212, as compared to $203,815 per project for other spot improvements.

As for state aid, California has been one of the leaders in appropriating funds for maintenance of grade crossing signals. J. W. Gavey, chairman, Committee D, reported to the C&S Section in 1967, concerning the California situation. He said: "The State of California Legislature passed several laws about two years ago whereby the Public Utilities Commission of the State is directed to assess the public agency with the same proportion of cost of maintenance of grade crossing signals as that agency bore with the construction cost. Historically, in California, there has been a 50-50 split between the railroad and the public agency except in the case of new crossings over the track where, in many instances, 100% of the cost has

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* *Editor's note: Our thanks to George McCann, Secretary, Communication & Signal Section, AAR, for permission to reprint and abstract material from Advance Reports and Proceedings.*

been assessed to the public agency.

"We now find that the public agency in many instances will be assessed with 100% of the cost of maintenance of grade signals at new crossings. At existing crossings where the signals have been changed, altered or constructed as the law states since October 1, 1965, the Public Utilities Commission will, according to the law, assess the public agency with that proportion, that same proportion of the cost of maintenance as it bore in construction.

"In order to establish maintenance costs, we made some extensive studies of various methods. We had to spend some 15 days in formal hearings before the Public Utilities Commission with the total of 18 days of conference in addition to the 15 days of formal hearings.

"The Division of Highways' prime effort was to safeguard the expenditure of gas tax funds. As a result of these studies, we established a unit value based on Manual Part 203 units," Gavey said.

"In establishing this unit value, we used Account 201, Superintendence; Account 216, Other Track Material; Account 220, Track Laying and Surfacing; Account 249, Signals and Interlockers; Account 269, Roadway Machines; Account 271, Small Tools; Account 326, Work Equipment Repairs; Account 328, Miscellaneous Equipment Repairs; Account 404, Signal and Interlocker Operation; and as is practice in some instances, certain costs in connection with automatic grade crossing protection devices were charged to Account 405. So these were all included.

"All charges not properly assigned to the cost of the maintenance of these signals were deleted from the calculations. In addition to these items, we included the usual additives for vacation allowance, railroad retirement and unemployment taxes, health and welfare benefits, public liability and Workmen's Compensation Insurance where applicable, sales and use taxes on supplies.

"As a result, we had, of the railroads operating in California, three railroads' cost to maintain the signal unit. Based on these roads' data, the cost ran between $29 and $30. Four railroads ran between $31 and $32. One railroad was over $35. On one railroad where the signal maintainer came in from near the northern border of Oregon to work in the northern part of California, the unit cost was $65. The Public Utilities Commission by Decision 72225 ordered the use of a $38 per AAR Signal Manual Part 203 unit," Gavey reported.

Also, he cited a section of the PUC order pertaining to continuing studies on costs. The PUC section is as follows:

"Each of the railroad companies in these proceedings is directed within 30 days after the effective date of this order to initiate studies either individually or collectively to determine the feasibility of maintaining accurate, actual cost records of the maintenance cost of automatic grade crossing protection in California, and the feasibility of developing a relative unit system of determining such costs restricted to signal system components utilized in California by said railroad companies and based upon the cost incurred in California by said railroad companies.

"The Commission staff and other parties hereto are directed to cooperate in all respects possible in making the studies ordered herein.

"The Commission shall, in the future, institute an investigation to determine the results of studies and determine if any modification of this order is required."

In reporting last fall on federal and state activities relating to crossing protection, Mr. Gavey commented on new laws in Minnesota, North Dakota, and Texas.

In 1963, the State of Minnesota enacted a law providing for a Highway Safety Account for the public's share of the expense in grade crossing installations. Moneys from this account are available for crossings not eligible for Federal Aid participation. This account is supervised, regulated and controlled by the Minnesota Public Service Commission.

Municipalities desiring additional protection on crossings may petition the Minnesota Public Service Commission requesting a hearing regarding the necessity for additional protection at such crossing. At the hearing, all interested parties present reasons why additional crossing signal protection should or should not be installed at the specific crossing in question. The Commission then decides the matter set forth in the complaint and makes a report in writing, which includes a Finding of Fact and an Order. The Order, designates the type of crossing signal protection to be installed and apportions the cost on the basis of benefits accruing to each party. The portion of costs allocated from the Highway Safety Fund Account varies.

"In 1965, the State of North Dakota enacted a law which provides for apportionment of costs for the installation of automatic grade crossing protection devices at other than Federal Aid projects. This fund is similar to that set up by the State of Minnesota. The requirements are also similar. A hearing is held to determine the need for the crossing protection. If crossing protection is ordered in, the cost of the installation of this protection is apportioned between the interested parties."

Signal Manual Part 203

Item No.	Description	Relative Unit Value
16 (a)	Non-coded track circuit	2
(b)	Superimposed circuit on track circuit	2
(c)	Coded track circuit	4
(d)	Auxiliary track instrument for train detection	2
20 (a)	Highway grade crossing signal, bell type, with or without reflectorized signs, per mast	1
(b)	Highway grade crossing signal, wig-wag or flashing-light type (one pair of flashing lights) with or without bell or reflectorized signs, per mast	2
(c)	Additional pair of flashing lights, illuminated "STOP" sign, auxiliary illuminated sign or rotating "STOP" disc	1
(d)	Each gates mechanism, automatic	4
21	Highway grade crossing gate, manual, per post	
	(a) Mechanical	1
	(b) Power	2
23	Switch circuit controller, signal or highway crossing protection	1

The State of Texas in the 60th Legislature of 1967 passed an appropriation bill known as the Grade Crossing Protective Fund.

"With the passage of this provision of the Appropriation Bill, Texas has now become the only State to project the 90-10 formula to maintenance as well as to installation. This formula applies only to Federal and State highway systems. It is assumed that the administration of this fund will be in accord with railroad views that the public is the beneficiary in the installation and maintenance of grade crossing protective devices to the extent of 90% and the benefit to flow to the railroads is 10%," Gavey reported.

This fund is provided from the State Highway Fund for joint participation by the Texas Highway Department and the respective railroad companies operating in the State. A sum of moneys is to be expended and administered by the Texas Highway Department under rules and regulations established by it for the welfare and safety of the traveling public. Also the fund is for the construction and maintenance of grade crossing protective devices on Federal, State and County highways and City streets. This distribution formula is one established by the Texas Highway Department applicable to the construction of such grade crossing protective devices on State highways.

This Texas legislation also directs the highway department to develop standards and criteria for the proper priority allocation of such funds to specific grade crossings demanding the installation and maintenance based upon incidence of automotive and train traffic at the crossing, accident experience, observation obstruction and other factors. The intent is to foster and establish a consistent and orderly program to eliminate hazards to the public on the public highways, roads and streets in the State. In arriving at costs payable by the State for the construction and maintenance provided herein, payment may be made by the State Highway Department to qualified recipients by fixed sum determined on a formula basis or otherwise under such rules and regulations as the Department may establish. This should be done with a view toward simplification of the auditing and accounting involved. Such highway funds established to be expended only for the stated purposes and to be effective Sept. 1, 1967; so stated the legislation. An order issued by the State Highway Engineer provides that maintenance costs of $100 for each single track crossing per year and $200 for each multiple track crossing per year be allowed.

Gavey reported that the Bureau of Public Roads is now following the recommendation of the Special Traffic Safety Committee of the American Association of State Highway Officials, which committee has recommended that all obstacles be located 30 ft from the edge of the pavement. Any obstacle located within 30 ft (except those with a breakaway type support) from the edge of pavement must be protected with a guard rail. The following is a statement made by the committee in regard to the guardrail:

"The criteria for installation of highway guardrail vary widely among the States. In some, guardrail was liberally installed; in others guardrail was noticeably lacking. A consistent nationwide policy should be followed using guidelines similar to those presented in the California Division of Highways report on 'Objective Criteria for Guardrail Installation, July 1966' and in the Highway Research Board's Special Report 81: 'Highway Guardrail: Determination of Need and Geometric Requirements.' Much existing guardrail is not now structurally adequate to afford adequate protection for highway users.

"The objective in placing guardrail is to lessen the hazard to traffic and not to protect any part of the roadway structure. Guardrail should only be used where the result of striking the object or leaving the roadway would be more severe than the consequences of striking the rail. In many cases, it was observed that guardrail at the junction with a bridge was offset so that the bridge parapet or other portions of the structure were exposed to traffic.

"To afford maximum protection and to develop the full strength of the rail in tension, all guardrails on approaches to structures must be attached securely to the structure and provide a relatively smooth configuration on the traffic side. In many cases, the length of guardrail provided is too short and it thus serves chiefly as a warning of the presence of the obstruction or hazard rather than as a physical protection. Locations were observed where approach guardrail had been ended at or just in advance of piers and other obstacles, which is a hazardous practice. Where needed in two or more closely spaced locations,

Committee D Highway Grade Crossing Protection

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R. B. **Whalen** (Vice-Chairman), field engineer-signals, Boston & Maine.
J. M. **Beavers**, engineer of signals-construction & maintenance, Baltimore & Ohio.
W. E. **Blevins**, office engineer-signals, Missouri Pacific.
C. P. **Darrough**, public projects engineer signaling, Southern Pacific.
J. A. **Early**, manager of communications & signal design, Penn Central.
E. W. **Horning**, crossing protection engineer, Chicago & North Western.
B. J. **Hutton**, signal engineer, Santa Fe.
R. W. **Kile**, signal engineer, Illinois Central.
E. A. **Krause**, signal engineer, Union Pacific.
H. L. **Kruke**, assistant engineer signals, Milwaukee Road.
L. V. **Lockhart**, regional signal engineer, Canadian National.
S. A. **Means**, signal & electrical superintendent-system, Southern.
C. J. **Mullen**, supervisor communications & signals, Central Vermont.
D. E. **Peterson**, assistant signal engineer, Northern Pacific.
J. P. **Powell**, engineer signals-system, Louisville & Nashville.
D. H. **Thomsen**, assistant to signal engineer-system, Burlington Lines.
H. W. **Trawick**, engineer of signals, Canadian Pacific.
R. B. **Waterman**, assistant chief engineer communications & signals, Seaboard Coast Line.

Railroad Consulting Member

D. H. **Worcester**, general signal supervisor, Chicago Transit Authority.

Consulting Members

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L. H. **Hawkins**, chief engineer, Railway Transport Commission, for Canada.
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J. A. **Parker**, chief railroad engineer, Illinois Commerce Commission.
L. H. **Stecker**, proposal engineer, Signal & Communications Division, Westinghouse Air Brake Co.
R. H. **Walser**, superintendent railroad safety & service, Iowa Commerce Commission.

guard rail should be continuous, since a few short panels of guardrail present added hazards rather than a safeguard.

"The approach ends of guardrail are one of the more formidable roadside obstacles with which traffic must contend. It is strongly recommended that all guardrail approach ends be flared away from the roadway and anchored to the ground, or otherwise blended into the approach environment. Sloped and tapered end sections should be in addition to the length needed for protection of the vehicle from the obstruction.

"All guardrail should be blocked-out or supported away from the post to minimize pocketing of the vehicle. A rubbing rail is also essential when the height of guardrail exceeds 27". A dike or curb should not be used in front of guardrail where it may result in a dynamic jump by the vehicle before it strikes the barrier.

"To insure that safe usage of the full shoulder width is possible guardrail should be installed with the face of the rail a minimum of 2 to 3 ft beyond the edge of the shoulder, and desirably at least 12 or 13 ft from the edge of the pavement."

As a result of the AASHO Safety Traffic Committee report, Texas and Missouri have issued orders to railroads operating in their states. The Texas statement is as follows:

"In compliance with the latest safety standards adopted by the AASHO and approved by the Bureau of Public Roads, all flashing-light signals will be protected at State's expense with our standard metal beam guard fence for a total distance of 100 ft unless conditions prohibit this length. A turn down guard rail will be used on the approach to the signal and a flared type end section will be used at the end of the guard fence, which will terminate 12 ft from the center of track. This will necessitate that the locations of signals be changed from 12 ft from center of track as recommended in Bulletin 6 of the AAR to 17 ft. This guard fence protection is not applicable to metal series railroad crossing signs which are of the break-away type as shown on Texas Highway Department standard MXS-67 and to flashing-light signals installed behind curbed roadways and medians.

"Bulletin 6 of the AAR recommends that signals be placed 6 ft from the edge of the pavement. The edge of pavement has been defined as the edge of the travelway. Since we have added paved shoulders on most of our highways and will continue to do so depending on traffic demands, it is considered that in the interest of safety to the traveling public and railroad traffic the following criteria be established:

"1) Cantilever signals in lieu of

Federal Highway Administration's Safety Spot Improvement Program does include upgrading of highway grade crossings, including money for improved crossing protection equipment, such as automatic gates and flashers.

Highway-Railroad Grade Crossing Safety Improvement Project

State	Projects	Total Cost	Federal Funds
Alabama	37	$ 4,039,442	$ 2,462,806.88
Arizona	8	141,823	119,246.00
Arkansas	8	536,060	285,110.00
Colorado	11	808,703	492,890.16
Delaware	13	199,170	179,253.00
Florida	1	513,881	513,881.00
Georgia	22	760,880	631,812.00
Idaho	8	50,700	45,730.00
Illinois	37	4,445,760	2,202,845.50
Indiana	28	567,130	339,143.00
Iowa	66	1,171,295	611,424.00
Kansas	32	545,584	478,112.07
Kentucky	11	135,972	122,599.00
Louisiana	5	2,598,697	2,453,510.00
Maryland	1	16,000	14,400.00
Michigan	22	523,489	463,569.00
Minnesota	21	395,954	164,397.42
Mississippi	20	246,171	223,913.00
Missouri	2	327,213	276,132.00
Montana	7	99,970	89,973.00
Nebraska	70	1,192,030	1,056,283.08
Nevada	4	2,632,393	2,214,459.00
New Mexico	1	20,000	18,000.00
New York	16	272,947	245,651.10
North Carolina	2	21,600	19,440.00
North Dakota	19	184,984	137,906.07
Ohio	25	5,159,683	3,457,866.00
Oklahoma	14	1,033,140	745,097.90
South Carolina	14	428,944	320,297.00
South Dakota	1	77	42.00
Tennessee	7	863,865	448,032.00
Texas	19	2,308,599	1,890,535.00
Utah	2	11,090	9,981.00
Virginia	2	554,878	320,979.00
Washington	2	26,268	23,641.00
West Virginia	4	76,690	60,221.00
Wisconsin	12	568,147	426,551.00
Wyoming	2	50,601	33,482.00
Total	**576**	**$33,529,830**	**$21,711,371.18**

ground signals shall be provided for all grade crossings where this type of protection is warranted. These signals are to be 6 ft outside a paved or unpaved shoulder. The cantilever arm shall be of such length as so as to extend a minimum of 2 ft within the travelway.

"2) On multilane divided highways having wide medians additional cantilever signals will be provided within the median area at the same distance from the shoulder as mentioned above.

"3) In urban areas where curbs have been provided for two lane or multilane highways, cantilever signals shall be placed a minimum of 4 ft from the face of curb. Additional signals will be provided of the type indicated in Bulletin 6 of the AAR in curbed medians.

"4) All cantilever signals shall have a 17 ft vertical clearance.

"5) With reference to providing automatic flashing-light signals supplemented with short-arm gates we will use for the time being the criteria set forth in Policy and Procedure Memorandum 21-10 issued by the Bureau of Public Roads, dated Oct. 3, 1958.

"The above criteria are considered as a guide and minor adjustments will be necessary based on the terrain, topography and other features. Any differences and exceptions to the above criteria will be resolved during the preliminary inspection between our representatives and your signal personnel.

"It is our intent to place the above criteria into effect immediately on all signal projects under consideration and on those projects for which arrangements have not been executed. Each railroad company will be advised shortly of the current projects which should be revised to provide cantilever signals."

Gavey reported that the State of Missouri has decided that future highway improvement projects will comply with the provisions of the special AASHO Traffic Safety Committee, where feasible.

These requirements provide, in part, that for all sign and light standards, bridge piers and other such obstacles to be located a minimum of 30 ft from the edge of the pavement. When it is not operatively feasible to locate flashing-light signals and other items as prescribed, they may be located to within 4 ft of the edge of the shoulder provided guardrail is installed 2 ft off the shoulder. In grade crossing situations where guardrail obviously cannot be constructed across the tracks, anchorage and strength are developed by heavy end posts set in concrete and 75

Railroads and public agencies may share installation or

PUBLIC BODY	INSTALLATION BASIS PUBLIC BODY/RAILROAD	MAINTENANCE BASIS	REMARKS:
ALABAMA			
Counties, Cities, Towns	50/50	100% RR	—
State Highway Dept.	90/10	100% RR	State has recently been more liberal in application of PPM21-10 Group 3 inasmuch as they have been requiring counties to contribute the 10% which RR previously contributed.
CONNECTICUT			
Public Utilities Commission	100% RR	100% RR	—
DELAWARE			
State Highway Department	By Agreement	By Agreement	Law provides that State can provide up to 100%.
FLORIDA			
State Road Department	90/10	100% RR	—
Counties, Cities & Towns	50/50	100% RR	State Legislature has enacted bills authorizing specific counties or towns to require the RR to install highway signals at the Public Bodies' requests on a 50/50 basis. Some of the counties and cities have negotiated on a 50/50 basis, and some counties and towns have negotiated jointly on a 1/3, 1/3, 1/3 basis.
GEORGIA			
State Highway Department	90/10	100% RR	—
Counties, Cities & Towns	50/50	100% RR	Legislature has passed a law requiring RR to install highway crossing signals at the Public Bodies' requests on a 50/50 basis with RR assuming all maintenance costs. This bill will have a limit as to the amount which can be spent each year.
MAINE			
Public Utilities Commission	50/50 on State & State Aid Highways only	100% RR	—
MARYLAND			
State Road Commission	100%	100% RR	—

ft of railing is required. Minimum guardrail installations otherwise are 125 ft in length.

"At locations where this type of guardrail protection is feasible, the State will furnish and install the guardrail since this is a State construction standard, and also, for the reason that the rail will usually extend well beyond railroad right-of-way. The cost of the standard guardrail installation is now estimated to be $600 and we consider it to be a part of the signal installation, with the costs shared similarly to the remainder of the signal installation costs. The railroad will continue to maintain the signals at its cost and the State will maintain the guardrail at its cost. At your flashing-light signal installations, it will extend only about 2 ft 9" beyond the signal standard, post spacing will be uniformly 6 ft 3", and a curved end section will be added to eliminate the dangerous exposed end. The latter two changes are now incorporated into all highway construction," the Missouri highway order states.

For protection of individual flashing-light signal posts, a semi-circular guardrail is used, being 12 ft 6" long. It is recommended for use where:

1) Existing driveways, entrances or other adjacent facilities would prohibit the installation of the long safety guardrail.

2) There is insufficient shoulder width on the highway to permit the installation of the long safety guardrail.

3) Urban highway characteristics preclude or do not warrant the long safety guardrail installations.

This type of guardrail, primarily for the protection of the signals, is to be included as a part of the signal installation by the railroad and be maintained by the railroad.

"It is our intention to use the new safety standards for the protection of the traveling public and the signals at all locations where feasible, regardless of whether the signal installation is being made as a part of a highway improvement project, a proposal from a railroad, or an order from the Missouri Public Service Commission. We also propose to field check each grade crossing to determine the preferred type of installation prior to entering into an agreement with the railroad involved.

"The standards and provisions for installation and maintenance of these features are limited to grade crossings on the State Highway System as this Department has no jurisdiction or control of other crossings," stated the Missouri Highway Department Order.

maintenance costs of highway crossing protection equipment.

PUBLIC BODY	INSTALLATION BASIS	MAINTENANCE BASIS	REMARKS:
	PUBLIC BODY/RAILROAD		
MASSACHUSETTS			
Department of Public Utilities	By Negotiation in certain cases	100% RR	—
NEW HAMPSHIRE			
Public Utilities Commission	By Negotiation	100% RR	—
NEW JERSEY			
State Highway Commission	85/15	100% RR	—
NEW YORK			
Public Service Commission	50/50	100% RR	—
NORTH CAROLINA			
State Highway Commission	90/10	50/50 at crossings which are a part of the State road system.	
RHODE ISLAND			
Department of Business Regulation Division of Public Utilities	100% RR	100% RR	—
SOUTH CAROLINA			
State Highway Department	Open negotiations between limits 90/10 FAP and 50/50 Secondary Road Funds	100% RR	—
VERMONT			
Public Service Board	Set by Board	By Negotiation	—
VIRGINIA			
Department of Highways	90/10	50/50 at crossings not in cities or towns. None in cities and towns.	
WEST VIRGINIA			
State Road Commission	100% RR	100% RR	—

DOMINION OF CANADA	Installation	Maintenance
Railway Grade Crossing Fund	80%	
Road Authority (Province or Municipality)	12½%	50%
Railway	7½%	50%

The Railway Grade Crossing Fund was established by the Government of Canada several years ago with an annual contribution which has been increased over the years to its present level of $15,000,000 per year, for improvements to railway-highway crossings.

The fund is administered by the Railway Transport Committee of the Canadian Transport Commission. The Railway Transport Committee has jurisdiction at all public railway-highway crossings in Canada whether level crossings or grade separations.

Data Modem Characteristics

Prepared by Leo J. Ritter Staff Engineer, Communications & Signals, Penn Central. Reprinted by permission of George McCann, Secretary, Communication & Signal Section, AAR.

Manufacturer	Collins Radio	General Electric
Model	TE-216-A-4D Modem	TDM 110 Modem
Transmit and/or receive	Transmit & receive	Transmit & receive
Full and/or Half Duplex	Full duplex	Full duplex
Dial up or Private Line Application	Private line	Private line
Turn around time (HDX)	—	—
Automatic answer capability	No	No
Type modulation	Phase shift plus AM	Frequency shift
Operating Frequencies	1000, 1500, 2000, 2500 Hz	1170 & 2125 Hz
Clock, internal or external	Internal	None
Loop back testing feature	Yes	Yes
Error rate	1 in 10^5, 21 db SNR	—
Error detection and/or correction	None	None
EIA RS-232-B interface	Yes	Yes
Bit or character rate	4800 bits/sec	Up to 300 bits/sec
Serial or parallel transmission	Serial	Serial
Impedance to line, ohms	600	900
Impedance to data equipment, ohms	RS-232-B	RS-232-B
Voltages to and from data equipment	RS-232-B	RS-232-B
Frequency stability	1 in 10^4	±0.5%
Level stability	+1.5 db	±1 db
Output levels to line, dbm	−15 to 0	−30 to 0
Input levels from line, dbm	−30 to +5	−40 min.
Line requirements, frequency response	4C voice	Voice grade
Line requirements, envelope delay	4C voice	Voice grade
Line requirements, impedance	540-600 ohms, 300-3200 Hz	Voice grade
Line requirements, signal to steady noise	21 db	—
Line requirements, signal to impulse noise	—	—
Method of operation	4 wire	2 or 4 wire
Temperature and humidity limits	0 to 50 deg C, 95%	−20 to +60 deg C
Power requirements	300 watts	115 volts AC, 10 watts
Dimensions and weight	9″ x 22″ x 17″, 72 lb	6″ x 9″ x 13¾″, 12 lb
Digital or analog	Digital	Digital

Upgrading communications doesn't have to cost $300 per mile. Ask your Stromberg-Carlson Man-on-the-Scene.

You can expand and upgrade your telephone communications without stringing another foot of wire or placing a single pole. A modern carrier system superimposed on your present facilities will do the job at minimal cost.

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S-C 761 PARTY-LINE CARRIER. A transistorized medium-haul, open-wire carrier system that reduces load on message circuits up to 75%. Upgrades way stations operating with 35-40 parties per line to only 10 parties or less per line. For added efficiency and economy, the 761 is easily converted to the 765 Trunk Carrier system.

FREQUENCY-RINGING TRUNK ADAPTER. This unique Stromberg-Carlson product works hand in glove with party-line carrier to provide multifrequency ringing. It fills the bill when you're faced with the limitation of an existing PABX that offers only straight-line ringing.

The Stromberg-Carlson Man-on-the-Scene is as near as your telephone. He is backed by our complete customer services that include everything from systems planning to financing. Call him at 716-482-2200. Or write Railroad Division, Stromberg-Carlson, 100 Carlson Road, Rochester, N.Y. 14603.

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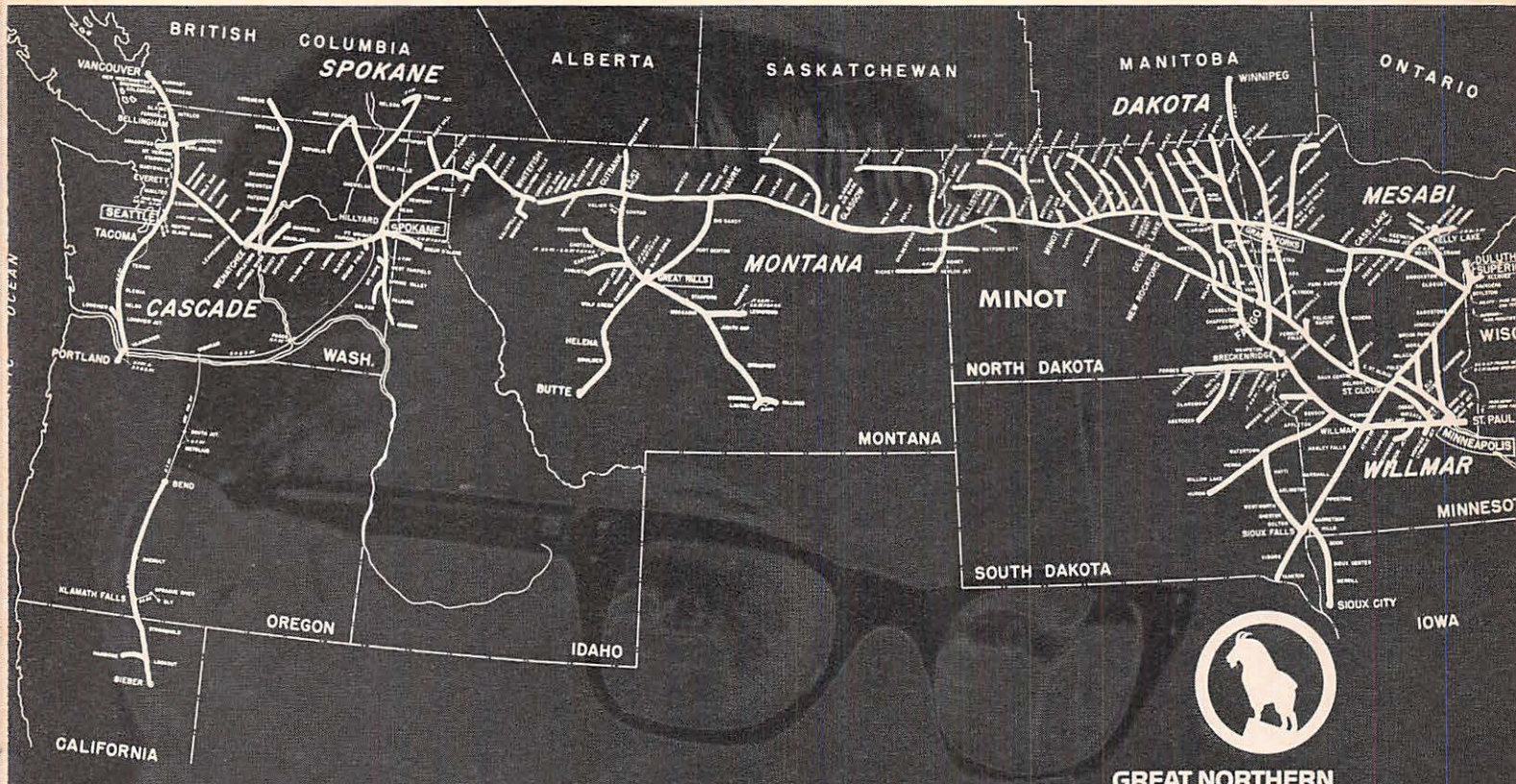


STAN DAVIS, ROCHESTER

Data Modem Characteristics

Prepared by Leo J. Ritter Staff Engineer, Communications & Signals, Penn Central. Reprinted by permission of George McCann, Secretary, Communication & Signal Section, AAR.

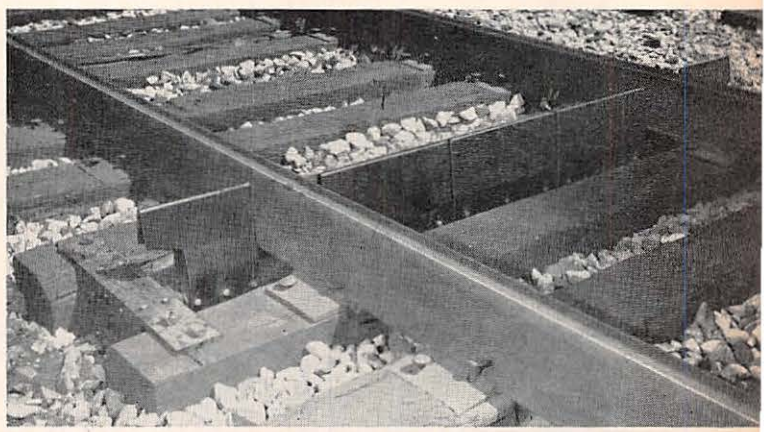
Manufacturer	General Electric	General Electric
Model	TDM 111 Modem	TDM 114 Modem
Transmit and/or receive	Transmit & receive	Transmit & receive
Full and/or Half Duplex	Full duplex	Full duplex
Dial up or Private Line Application	Dial up	Dial up or Private line (acoustically coupled)
Turn around time (HDX)	—	—
Automatic answer capability	Yes	No
Type modulation	Frequency shift	Frequency shift
Operating Frequencies	1170 & 2125 Hz	1170 & 2125 Hz
Clock, internal or external	None	None
Loop back testing feature	Yes	Yes
Error rate	—	—
Error detection and/or correction	None	None
EIA RS-232-B interface	Yes	Yes
Bit or character rate	Up to 300 bits/sec	Up to 300 bits/sec
Serial or parallel transmission	Serial	Serial
Impedance to line, ohms	900	Acoustically coupled
Impedance to data equipment, ohms	RS-232-B	Model 33 Teletype
Voltages to and from data equipment	RS-232-B	Model 33 Teletype
Frequency stability	±0.5%	±0.5%
Level stability	±1 db	—
Output levels to line, dbm	−30 to 0	—
Input levels from line, dbm	−40 min.	—
Line requirements, frequency response	Voice grade	—
Line requirements, envelope delay	Voice grade	—
Line requirements, impedance	Voice grade	—
Line requirements, signal to steady noise	—	—
Line requirements, signal to impulse noise	—	—
Method of operation	2 wire	—
Temperature and humidity limits	−20 to +60 deg C	−20 to +60 deg C
Power requirements	115 volts AC, 10 watts	115 volts AC, 10 watts
Dimensions and weight	6″ x 9″ x 13¾″, 13 lb	7″ x 9″ x 5″, 10 lb
Digital or analog	Digital	Digital

"Sure as heck wish we had installed one of them new Servo detectors that spot dragging equipment."

JUDGING from the look of things, it appears that these Civil War railroad men needed a lot more than a dragging equipment detector to avoid the mishap that befell them.

On today's high speed railroads and transit lines, dragging equipment can be a serious problem. To help solve the problem, Servo has developed the Model 8100, a rugged electro-mechanical system that detects and signals the presence of dragging equipment on rail-traveling vehicles. It can be actuated in either direction and automatically resets itself after being deflected by dragging equipment. Torque actuation range is from 200 to 800 inch-pounds, and can be readily adjusted in the field without hazard to personnel. The sensing and control mechanism is designed to eliminate "false alarms" caused by wind pressure. All internal components are housed in a sealed compartment for protection against dirt and moisture.

The Model 8100 won't eliminate dragging equipment from your rolling stock. But it can prevent unnecessary damage to cars and tracks caused by dragging equipment that goes *undetected*. For further information on the Model 8100, send for our Tech Data Publication 2018.



Model 8100 Dragging Equipment Detector is installed between two cross ties. It is not dependent on tie alignment and is unaffected by shifting of ties. Special alignment procedures are not required. Blade height is adjustable to fit rail sizes varying from 110 to 155 pounds. The steel detector blades can be replaced if damaged by unusually heavy dragging equipment.

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MEMBER RPI

Circle 16 on reader service card on page 38

News Briefs

● AAR response to the FCC inquiry in radio teleprinter communications systems stated that "Mobile teleprinters would be useful in the railroad industry as a means of transmitting quickly and accurately large volumes of instructions and information from an office to train crews, supervisory personnel and other employees. The great advantage of teleprinting would lie in its minimizing the chance of error that is so often encountered in oral messages. It also insures earliest receipt of messages when personnel are away from their mobile units. Mobile radio teleprinters in railroad service would primarily complement existing voice systems. Teleprinters would be authorized on all frequencies in all frequency bands available for railroad land mobile communication by permitting F2 and F9 emission secondary to F3."

The AAR answered yes to these FCC questions: Can more than one teleprinter channel be accommodated within a single voice channel? Can radio teleprinter emission be accommodated on very narrow channels, that is, less than for radio telephony? Can existing teleprinters, or teleprinters under development be accommodated on the narrow frequency bands? At present, certain frequencies in the 450 mHz band (in accordance with Docket 13847) are available for testing radio teleprinters. FCC said that "additional frequencies in the 450 to 470 mHz band as well as in other bands may be made available for use of radio teleprinters if their compatibility with stations authorized on a regular basis can be established."

AAR said "it would be undesirable to limit teleprinter use to narrow channels or portions of existing voice channels at this point in teleprinter development. The Commission's rules should permit users maximum flexibility in adopting technology to their operations.

"Initially, at least, railroad radio teleprinters could share existing voice channels on a secondary basis. The rules, however, should permit use of discrete and separate bands for radio teleprinters to meet changing operating techniques.

"Teleprinter and telephony systems sharing common frequencies would necessitate modification of receivers operating in the same area by use of some acceptable selective calling system," the AAR statement noted.

Continuing, the AAR said: "If teleprinter should be authorized on a secondary basis on existing voice channels, need for additional channels would be minimized.

"Existing standards for voice channel usage as well as present operator and identification requirements should cover teleprinter operations adequately, except that F2 and F9 signaling for teleprinter operation should be permitted. Within these limitations, the rules should permit maximum flexibility of input codes and transmission codes to meet a variety of system requirements as determined by users," AAR commented.

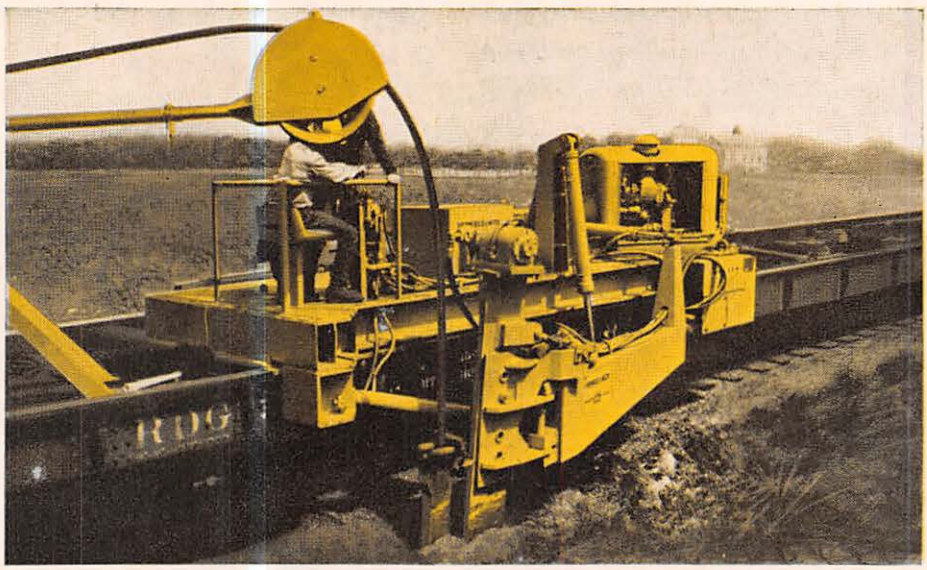
Also, AAR said: "The use of FM broadcasting station multiplex techniques for radio teleprinter operations is not feasible in railroad applications because of operational problems encountered.

"The ten 450-470 mHz channels reserved for radio teleprinter use should be retained. Rules should nevertheless permit shared teleprinter/telephony use as an alternate to the teleprinter use," AAR statement concluded.

● ASME/IEEE railroad conference to be held April 15 and 16 at the Queen Elizabeth hotel in Montreal, Que., will feature two papers of interest to signal and/or communications officers, to be delivered on Wednesday April 15. "Operational Control Strategy for Bay Area Rapid Transit System," by G. M. Thorne-Booth and J. W. Brownson, transportation division, Westinghouse Electric Corp.; and "Illinois Central Suburban Automatic Revenue Collection System," by Leonard A. West, electrical engineer-fixed property, Illinois Central.

● CHESAPEAKE & OHIO/BALTIMORE & OHIO has ordered type J coding

NOW...underground cable for railroads
H & M does the groundwork



Underground cable is now being laid by rail. Henkels & McCoy's new railroad plow features a unique vibratory blade, mounted on a flatbed car. The plow is effective even in tough terrain and narrow gorges . . . lays cable automatically, and requires minimum tamping to replace the disturbed ground.

Railroads are now taking advantage of this new, highly efficient communication development to eliminate costly overhead lines and to reap the benefits of underground cable uninterrupted by storms and other disasters.

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Circle 17 on reader service card on page 38

systems and interlocking controls from General Railway Signal Co. for installation at RH Tower at Cincinnati, Ohio. The project involves 3 remote control interlockings in a 6-mile area.

● COMMUNICATION & SIGNAL SECTION, AAR, Sectional Meetings will be held Tuesday, Arpil 15 in Omaha, Neb., and on May 14 in Washington, D.C.

● DEPARTMENT OF TRANSPORTATION has awarded a two-phase contract to assist in evaluating advanced communications systems for use in high-speed ground vehicles up to 350 mph to New Mexico State University. NMSU will draw up requirements for a vehicle-wayside communications system.

● FEDERAL COMMUNICATIONS COMMISSION has proposed to re-allocate 115 mHz of spectrum space for land mobile uses in the 806-940 mHz area, but only as a temporary step toward long-range goals. Common carriers would get 75 mHz of the total space and private radio users would get 40 mHz.

● FLORIDA EAST COAST has four types of detectors spotted at about 30 miles intervals between Jacksonville and Miami, Fla., approximately 360 miles. Clearance detectors are the latest to join existing hotbox, dragging equipment and loose wheel detectors. When a detector is actuated, a report in the form of a graph is read by the train dispatcher at New Smyrna Beach. He notifies the train engineer by radio if the report shows anything that needs checking. The newest detector spots oversize or shifted loads. It consists of two concrete poles which stand 30 ft above ground. A pipe framework between the poles supports two electronic receivers. Two light transmitters are placed about 5 ft on the ground in front of the poles and 3 ft 9¾" out from the rails on each side. Any passing object that breaks the light beam shows up as a strong blip on the paper chart recorder at New Smyrna Beach. This is hotbox detector recording chart paper. The blips recorded for the oversize load detector are tall and closely spaced together totaling possibly eight or nine. The dragging equipment detector blips, again about 15 mm high, consist of four or five spaced closely together so as to present a wide-band bar. The loose wheel detector blips are single high marks that are much taller than a hotbox indication.

● INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERS will hold its international convention and exhibition March 24-27 in New York. Of interest to signal and/or communications engineers are the following: Rail Transportation Systems—Monday March 24 in the Murray Hill Suite, New York Hilton hotel: "Automatic Train Control for Transit Expressway," by G. M. Thorne-Booth, manager, communications and control transportation division, R. H. Perry, Sr., engineer, Westinghouse Electric Corp., East Pittsburgh, Pa.; "Revenue Collection Systems," by W. D. Gootnick, director of systems, Advanced Data Systems, Beverly Hills, Calif. Wednesday.

John H. Sawyer
Penn Central

H. V. Van Valkenburg
Anaconda Wire & Cable

Wednesday afternoon, March 26 in the Murray Hill Suite, New York Hilton hotel. Communications Systems-Management and Control: "Circuit Switched Network Management: Philosophy and Implementation," by W. S. Hayward, director, traffic studies center, Bell Telephone Laboratories, Inc., Holmdel, N.J.; "Network Control for Stored and Forward Systems," by Bernard Rider, assistant vice-president engineering, Western Union, Arlington, Va.; "MALLARD System Control—Its Need and Function," by T. A. Pfeiffer, Jr., technical director, tactical communication system office, U.S. Army Electronics Command, Fort Monmouth, N.J.; "Network Control for Multiple Access Communications Satellite Systems," by D. F. Parkhill, acting department head, satellite communications systems, The MITRE Corp., Bedford, Mass.; "Communications and Scheduling in Time Shared Systems," by J. C. Castle, manager, engineering information services department, General Electric Co., Bethesda, Md.

Communications and the Computer—Thursday morning, March 27 in Murray Hill Suite, New York Hilton hotel. "Computers and Communications—What's the Problem?" by D. C. Evans, director, computer science department, University of Utah, Salt Lake City, Utah; "Research Sharing Computer Network," by L. G. Roberts, special assistant for information sciences, ARPA, Department of Defense, Washington, D.C.; "Communications for Interactive On-Line Computer Systems," by Gerald Estrin, professor, electrical engineering, U.C.L.A., Los Angeles, Calif.; "Data Communication Requirements of Computer Systems," by R. Kerby, manager, advance technology, IBM Corp., Research Triangle Park, N.C.; "Computers from the Communications Viewpoint," by E. E. David, Jr., executive director, research communications systems division, Bell Telephone Laboratories, Inc., Murray Hill, N.J.

● PENN CENTRAL will spend about $1.8 million to install a traffic control system on 36 miles of NYC between Sharon yard, Cincinnati, Ohio, and Dayton, and on 30 miles of PRR line between London and Xenia, Ohio. Control will be from a machine at Cincinnati. Approximately 89 miles of track will be removed in this project.

● SANTA FE's application for signal changes between Pequot, Ill. and Fort Madison, Iowa is the subject of a report and order of Robert R. Boyd, hearing examiner, Federal Railroad Administration, DOT. AT&SF proposed to install a traffic control system with wayside signals on 167.5 miles of double-track line with associated intermittent inductive automatic train stop system replacing a continuous inductive three-speed automatic train control system with cab signals and without wayside signals. The report and order approves of AT&SF's application except that the railroad is not required to install an intermittent inductive automatic train stop system.

● SOUTHERN has ordered 8 model 50B retarders from the Signal & Communications Div. of WABCO for installation at Brosnan yard in Macon, Ga.

● TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS has ordered type J coding systems and other interlocking controls from General Railway Signal Co. to control its Market St. interlocking, St. Louis, Mo. from a control machine to be located in SH Tower, Venice, Ill., about 3.5 miles distant.

● UNION PACIFIC has ordered 25 sets of type EL cab signal equipment from the Signal & Communications division of WABCO for installation on new diesel-electric locomotives.

Railroad Personnel

● CHESAPEAKE & OHIO/BALTIMORE & OHIO: **Hollis G. Helton,** assistant engineer signals and maintenance, appointed assistant engineer signal construction and maintenance. **Luther M. Anderson,** leading circuit engineer signals, appointed assistant engineer signals and maintenance. **Wilbur H. Kinsinger,** system signal inspector appointed leading circuit engineer signals. **Howard W. Conzett,** communications inspector, appointed assistant communications engineer. **Jarrett E. Maynard,** communications foreman, appointed communications inspector. **Donald E. Barney,** telephone maintainer at Cumberland, Md., appointed communications inspector at Huntington, W. Va. **Billy L. Morris,** chief circuit engineer-signals, appointed engineer signal development and design. All the above men will be headquartered at Huntington, W. Va. **Meredith D. Hammond,** signalman, Cincinnati, Ohio, appointed assistant signal supervisor there. **Thomas W. Lanahan, Jr.,** traveling signal mechanic, appointed assistant supervisor signals at Richmond, Va. **Seth A. Unroe,** signal maintainer, appointed assistant supervisor signals at Clifton Forge, Va. **Herbert Sharp,** assistant signal supervisor at Chicago, appointed supervisor of signals, Staten Island, N.Y., succeeding **Hiram E. Childers,** appointed superintendent of signals and communications, Bangor & Aroostook (RS&C Dec. 1968 page 11). **Lawrence A. Payseure,** assistant communications engineer, appointed manager communications and signal research at Baltimore, Md.

● LOUISVILLE & NASHVILLE: **D. E Boatright,** signal repair shop foreman, Louisville, appointed assistant signal super-

(Please turn to page 34)

View from the Crossarm

● The National Home Study Council has issued a Directory of Accredited Private Home Study Schools. Several of the schools listed provide courses in electricity, electronics and studies leading to FCC radio-telephone licenses. The accrediting commission has been approved by the U.S. Office of Education as a "nationally recognized accrediting agency."

The accrediting commission establishes educational, ethical and business standards; examines and evaluates private home study schools in terms of these standards; and accredits those who qualify. The commission does not examine and approve programs normally given at the post-collegiate professional level.

Members of the accrediting commission are: Herold C. Hunt, chairman, Eliot Professor of Education, Harvard University; Robert A. Nottenburg, vice-chairman, vice–president, education and training, Cleveland Institute of Electronics; John C. Buckbee, chairman of the board, Art Instruction Schools; Ronald D. Clark, dean of the faculty, International Correspondence Schools; Lawrence G. Derthick, assistant executive secretary for professional development and instructional services, National Education Association; S. Norman Feingold, national director, B'nai B'rith Vocational Services; Charles B. Marshall, vice-president and educational director, La Salle Extension University; Byron Menides, executive vice-president, Famous Artist Schools; and Brantley Watson, vice-president, human relations, McCormick & Company, Inc.

Each accredited school meets the following standards:

- It has a competent faculty.
- It offers educationally sound and up-to-date courses.
- It carefully screens students for admission.
- It provides satisfactory educational services.
- It has demonstrated ample student success and satisfaction.
- Its tuition charges are reasonable.
- It advertises its courses truthfully.
- It is financially able to deliver high quality educational service.

To become accredited each school has made an intensive study of its own operation, opened its doors to a thorough inspection by an outside examining committee, supplied all information required by the accrediting commission, and submitted its instructional material for a thorough review by competent subject-matter specialists. This examination is repeated every five years.

Here is a selected list of private home study schools that have courses which may be applicable to signal and communications men for training at the technician or engineering level. For further information write the National Home Study Council, 1601 18th Street, N.W., Washington, D.C. 20009, David A. Lockmiller, executive director; or to the individual schools.

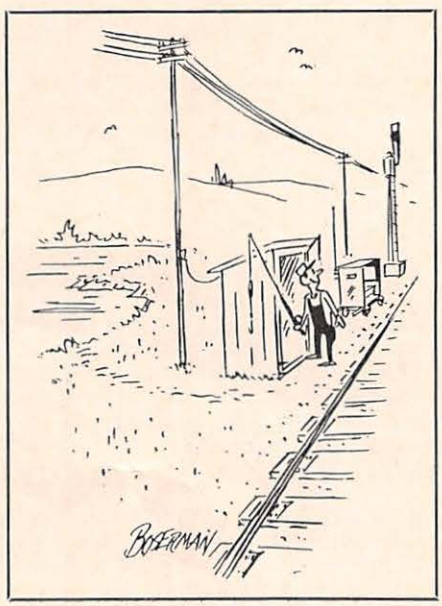
American School, Drexel Ave. at 58th St., Chicago, Ill. 60637. Founded 1897. Electrician, electrical technician, instrumentation, computers, transistors, electronic communication (includes FCC license preparation), magnetic amplifiers, industrial electronics.

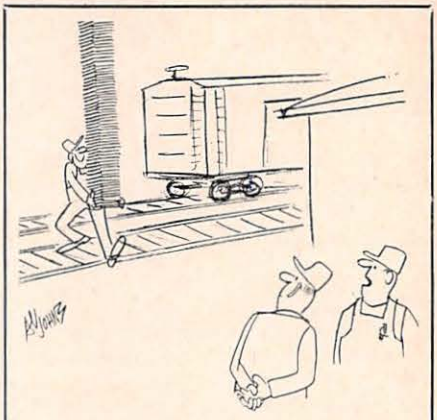
American Technical Society, 850 E. 58th St., Chicago, Ill. 60637. Founded 1898. Vocational training in electricity, electronics.

Central Technical Institute, 1644 Wyandotte St., Kansas City, Mo. 64108. Founded 1931. Electronic technology, radio operator course, electronic engineering technology. Resident programs in automation, industrial electronics and electronic engineering technology leading to Associate in Science degree.

Chicago Technical College, 2000 S. Michigan Ave., Chicago Ill. 60616. Founded 1904. Electrical drafting and design. Resident programs leading to Associate and Baccalaureate degrees available.

Cleveland Institute of Electronics, 1776 E. 17th St., Cleveland, Ohio 44114. Founded 1934. Electronics technology, industrial electronics and automation, 1st class FCC license, electronic communications (including 2nd class FCC license), carrier telephony, advanced electronics technology.





"Look's like Ed's article finally came out in Railway Signaling."

Commercial Trades Institute, 1400 W. Greenleaf Ave., Chicago, Ill. 60626. Founded 1942. Industrial electronics– service and maintenance.

CREI, Home Study Division, McGraw-Hill Book Co., 3224 16th St., N.W., Washington, D.C. 20010. Founded 1927. College level programs in electronic engineering technology and special programs for engineers include specialized study in communications, automatic control engineering. Other diploma programs include industrial electronics for automation.

DeVry Institute of Technology, 4141 W. Belmont Ave., Chicago, Ill. 60641. Founded 1931. Computer control electronics, electronic control systems, electronic instrumentation, electronic communications including FCC license preparation, electronic automation technology. Terminal resident school programs available in Chicago, Phoenix, Ariz., and Toronto, Ont.

Grantham School of Electronics, 1505 N. Western Ave., Hollywood, Calif. 90027. Founded 1951. A college-level educational program in electronics engineering technology, consisting of five sections by correspondence and one section in residence: The five correspondence sections are: (1) basic electricity-electronics technology with mathematics; (2) communications circuits and systems; (3) general science, engineering analysis and classical physics; (4) analytic geometry, relativistic physics and calculus; and (5) engineering graphics and electronic circuit design. The resident section is a four-month electronics laboratory course. A non-credit course is offered in FCC license preparation.

International Correspondence Schools, Scranton, Pa. 18515. Founded 1890. Electrical engineering, communication technology, electrician, electronic computers, electronics, FCC license preparation, industrial

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RADIO-COMMUNICATIONS TECHNICIAN—Alexandria, Va. area. Applicant must be high school graduate with at least a second-class FCC Radio License. Salary based on education and previous experience. Liberal fringe benefits. Railroad will pay relocation expenses. **Contact Mr. T. B. Choate, Director of Personnel, Richmond, Fredericksburg and Potomac Railroad Co., Room 209 Broad St. Station, Richmond, Va. 23220. An equal opportunity employer.**

telemetering, instrumentation, special industrial programs and telephony.

ITT Educational Services, Inc., Extension Division, 1720 E. 38th St., Indianapolis, Ind., 46218. Founded 1963. License preparation course for the FCC license and the radio-telephone 2nd class license; courses in semiconductor fundamentals, and practical applications of transistors basics.

Massey Technical Institute, Inc., 148 E. 7th St., Jacksonville, Fla. 32206. Founded 1894. Radio and industrial electronic servicing.

National Radio Institute, 3939 Wisconsin Ave., N.W., Washington, D.C. 20016. Founded 1914. Complete communications, industrial-military electronics, FCC license, basic electronics, electronics for automation, and mobile communications.

National Technical Schools, 4000 S. Figueroa St., Los Angeles, Calif. 90037. Founded 1905. Master course in electronic communications (including FCC), FCC license course, industrial and computer electronics, basic electronics. Resident training available with Associate in Science degree offered in electronics technology.

Philco Technical Institute, 219 N. Broad St., Philadelphia, Pa. 19107. Founded 1955. Offers advanced programs for the experienced technician and field engineer. Courses include solid-state electronics and digital computer fundamentals. Resident training available.

Radio Television Training of America, 229 Park Ave. South, New York, N.Y. 10003. Founded 1949. Basic electronics, AM and FM servicing with basic and advanced test equipment. Comprehensive, course including basic electronics through television servicing. Radio, AM and FM technician. Advanced techniques of radio servicing, transistors and printed circuits course. Electronics technician. Industrial training division.

RCA Institutes, Inc., 320 W. 31st St., New York, N.Y. 10001. Founded 1909. Career programs in telecommunications, solid-state electronics, FCC license preparation, automation electronics, industrial electronics, automatic controls, digital techniques, and electronics drafting. Courses in basic and advanced electronics, introduction to electronics, electronics fundamentals, transistors, communications electronics, FCC license preparation, mobile communications, automation electronics, automatic controls, digital techniques, industrial electronics. Resident school electronics programs available in New York City and Cherry Hill, N.J. Institute for professional development offers seminars in high-level technologies throughout the country.

Technical Training International, Inc., 203 Lincoln-Broadway Bldg., 1475 N. Broadway, Walnut Creek, Calif. 94596. Founded 1939. Electronics training covering introductory, basic, advanced, radio and TV and industrial.

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In Canada: CAE Industries Ltd., Montreal • In Europe: CAE Industries GmbH, Stolberg, West Germany

Circle 18 on reader service card on page 38

NEWS BRIEFS

(Continued from page 31)

visor, Birmingham, Ala.

● PENN CENTRAL: **John H. Sawyer,** regional engineer communications and signals at Cleveland, Ohio, has retired. Mr. Sawyer was born at East Fultonham, Ohio, on July 8, 1907. After education at Western Reserve and Ohio State Universities, he joined the New York Central in 1925 as a signal helper. Subsequently, he rose through various positions in the signal department becoming signal foreman in 1938 and engineer draftsman in 1940. He was appointed circuit engineer at Cleveland in 1949, and four years later promoted to office engineer. In 1956 Mr. Sawyer was appointed assistant signal engineer at Syracuse, N.Y. and a year later, promoted to signal engineer at Cleveland. In 1964, he was appointed district engineer, communications and signals at Cleveland and following merger of New York Central with Pennsylvania in 1968, Mr. Sawyer was appointed regional engineer, communications and signals.

● SOO LINE: **David L. Jones,** chief communications maintainer, Shoreham yards, Minn., appointed electronics engineer, with headquarters at Minneapolis, Minn. **Harris E. Meyer,** communications maintainer at Shoreham yards, Minn., appointed assistant electronics engineer at Stevens Point, Wis.

● SOUTHERN: **Clifford P. Beach, Jr.,** management trainee, appointed assistant supervisor communications at Princeton, Ind.

Supply Trade News

● ANACONDA WIRE & CABLE CO.: **H. V. Van Valkenburg,** vice president sales, eastern region, will head up a special program to develop and service markets in the field of transportation. A native of East Providence, R.I., he received an electrical engineering degree from the University of Rhode Island. Following college, he joined the Transportation Div. of Westinghouse Electric Corp., and in 1931 joined Anaconda. He has served in various engineering manufacturing and sales positions, his most recent being in charge of Eastern regional sales.

● COPPERWELD STEEL CO.: **J. J. Campbell, Jr.,** manager of government sales, has been promoted to eastern sales manager, Wire & Cable Div., with headquarters in New York. A native of Brooklyn, N.Y., Mr. Campbell is a graduate of Fordham University with a B.S. degree.

J. J. Campbell, Jr.
Copperweld Steel

Daniel E. Turner
Gen. Ry. Signal

Roger J. Eckerson
Gen. Ry. Signal

Robert E. Harmon
Harmon Electronics

● GRASIS FABRICATING CO.: **E. L. Margolf,** former project manager, Lenkurt Electric Co., has joined the staff of Grasis to provide assistance in planning sales and service.

● GENERAL ELECTRIC CO.: **J. H. Lovelace** appointed southeastern regional manager of Telecommunications Systems Sales for the Communication Products Dept., with offices in Atlanta, Ga.

Albert C. Giesselman appointed manager of Business & Product Planning section of the Mobile Radio Dept., with headquarters in Lynchburg, Va.

● GENERAL RAILWAY SIGNAL CO.: **Daniel E. Turner,** product engineer, appointed section manager-product design. **Roger J. Eckerson,** sales engineer, Chicago, appointed section manager-application engineer, with headquarters in Rochester, N.Y.

Mr. Turner, a graduate of Penn State University joined GRS in 1953 as an application engineer. Later he did transportation research in the sales department and was involved in product engineering work in the yards and terminal area, subsequently becoming a product engineer. Mr. Eckerson, a graduate of Syracuse University, joined GRS in 1959 as an application engineer. After having previous experience in the utility fields and with the New York Central, subsequently he was appointed sales engineer at Chicago.

● HARMON ELECTRONICS, INC.: **Robert E. Harmon,** vice-president sales, elected executive vice-president. **Herman G. McGrath, Jr.,** sales manager, elected vice-president sales and field service. **Alden L. Stevenson** elected vice-president, engineering and test, and **Forrest H. Ballinger** elected chief engineer.

● ITT TELECOMMUNICATIONS: **Edward F. Tuck** elected vice-president and technical director with headquarters at Memphis, Tenn. Raymond Wulfe appointed sales representative, western region, industrial microwave systems with headquarters at 12049 East Trail, San Fernando, Calif.

Mr. Tuck, a native of Memphis, Tenn., graduated from the Missouri School of Mines and Metallurgy in 1953 with a bachelor of science degree in electrical engineering. Prior to joining ITT, Mr. Tuck had done engineering work on carrier and microwave for Lenkurt Electric Co., and in 1964 he was a founder of Kebby Microwave Corp., which was purchased by ITT. In 1966, he joined ITT as assistant director of transmission development, and in 1968 was appointed technical director.

● MOORE ASSOCIATES: **Paul H. Stone,** executive vice-president, appointed president, succeeding **Dan G. Skully,** resigned to establish a consulting firm.

● RADIO CORP. OF AMERICA: **William T. Glass,** fore fleet account executive and sales manager, Seattle, Wash., appointed manager, sales development for RCA mobile radio systems, Camden, N.J.

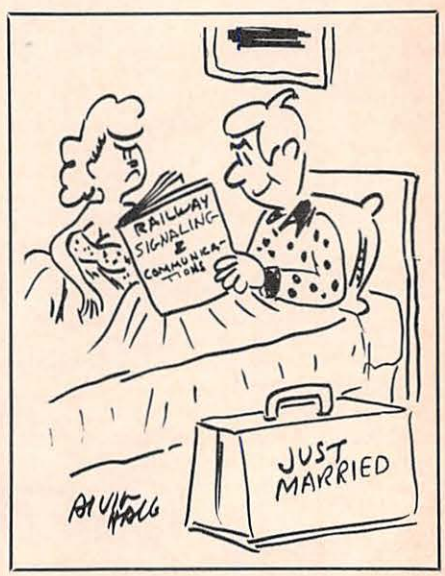
● STROMBERG-CARLSON: **Thomas R. Worthy,** vice-president industrial relations appointed vice-president customer service, a newly created position.

H. G. McGrath, Jr.
Harmon Electronics

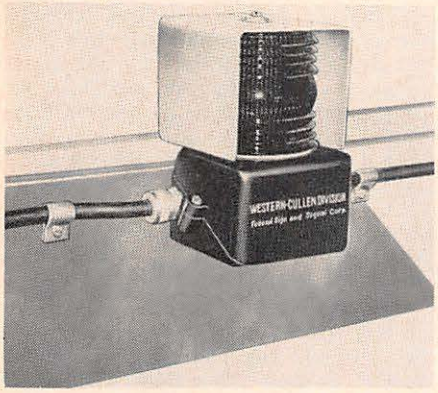
Alden F. Stevenson
Harmon Electronics

Forrest H. Ballinger
Harmon Electronics

Edward F. Tuck
ITT Telecomms.



Product News



Gate Arm Lamps

A self-contained junction box, and binding posts that are offset and slanted for ease and speed in straight-forward wiring are among the advantages of type 1590 gate arm lamps, for use on railroad crossing gates and security gates.

The Fresnel lens of the lamp is a polycarbonate, which is said to be 250 times stronger than safety glass and 30 times stronger than the toughest acrylic glazing. The base and cover are of another high-impact plastic material. The shield is aluminum. It weighs 1.25 lb and meets AAR specifications. *Western-Cullen Div., Federal Sign & Signal Corp. Circle 101 on Reader Service Coupon.*

Data Set

A data modem is capable of transmitting and receiving serialized digital data at 2000 bits/sec over the switched direct distance dialing network. This new unit, the Transidata T201A data set is electrically and functionally identical to the Western Electric 201A. The T201A interfaces with Western Electric 804A data sets in installation requiring alternate voice/data communications. This arrangement also provides automatic answer and control functions, and compatibility with Western Electric 801A and 801C automatic call units.

Two versions of the T201A are available. The T201A3 has an internal crystal-controlled clock for controlling the data flow. The T201A4 is used in applications where the timing signal is provided by a business machine. Numerous options are available with each version enabling the T201A to meet a wide range of communication requirements. The T201A can be supplied in either desk top cabinet, or in a standard 19" rack-mounting assembly. *Sangamo Electric Co. Circle 102 on Reader Service Coupon.*

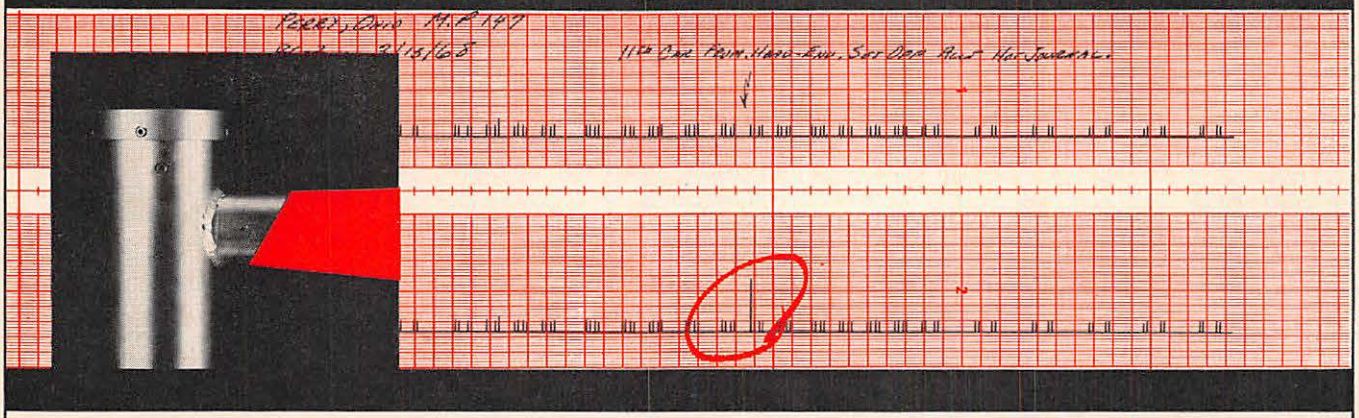
Subway Radio

New transit carrier is available for control of wayside VHF radio stations by dispatchers of subways systems. Control equipment is type 65B frequency division multiplex transit carrier. Separate amplitude-modulated carrier signals are provided, spaced 10 kHz between channels, from 20 kHz to 210 kHz. Thus, up to 20 base stations can be modulated and controlled over only one telephone pair. To counteract the attenuation slope of the cable pair, Cardion developed the type 653B repeater, that has an amplification slope opposite to that of the cable attenuation. The result is that, when the repeaters are properly spaced along the cable, amplification of all 20 carrier channels is reasonably uniform. Amplification is required, of course, to make up for the normal loss, due to length, of the cable pair.

The type 651B transmitter is crystal controlled. It is turned on only when it is desired to switch the associated remote base station from receive to send. The type 652B receiver is normally muted unless its specific carrier is received. In addition, a carrier-operated relay is built-in, to provide the control (press-to-talk, for example) function. Up to 5 units (transmitter, receiver, and repeater, in any combination) can be powered by 12 volts DC from the type 654B power supply. The type 657B meter panel is available to measure all important input and output levels as well as the DC bus inside each unit. *Cardion Com-*

(Please turn to page 36)

You'll get our signal, *(without "clutter")*



Clear, high resolution, "Cleartrace" recordings, like none you've seen before, coupled with Railtron's exclusive archbar scan technique * which virtually eliminates "roller bearing clutter", gives the finest performance available from any hot box detector system—all at lower cost, too!

The RT-100 Journal Sentinel System is a complete package, lending itself to rapid installation and ease of maintenance.

Now available, also, is the new WHEELMARK JET. A system for rapid search, accurately identifying hot boxes. Cuts train delay time by an estimated 50%. Applicable to all detectors, regardless of manufacturer.

Investigate Impactor. Impactor is a versatile low-cost, wheel defect-dragging equipment—clearance detection system based on new principles.

The good economic health of the railroads is our primary and only concern, for Railtron's future is geared to that of this industry. We are committed solely to the task of resolving problems involving the safety of the nation's greatest transportation facility. GO MODERN—GO RAILTRON. For more information write: Railtron Corporation, 2500 W. Broad Street, Richmond, Va. 23220. Attention: W. M. Pelino.

RAILTRON CORPORATION

RAILTRON CORPORATION

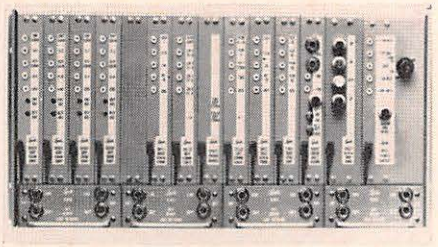
Circle 19 on reader service card on page 38

(Continued from page 35)

munications. Circle 103 on Reader Service Coupon.

Frequency Meter

A new single, portable instrument combines a frequency meter, a deviation meter and a signal generator. As a frequency meter, model FM-9E has an accuracy of .0001%, with direct reading dials, a 500 microvolt sensitivity and provides coverage in the low, high and UHF bands. As a deviation meter, the FM-9E has three peak deviation ranges of 0-1.5, 0-5 and 0-15 kHz. Special output on the rear panel is for modulation distortion observation. Also, it has a station monitor. As a signal generator, the FM-9E has direct reading calibrated RF output .1 to 500 microvolts, built-in internal 1 kHz modulator, and 400-500 kHz RF output for IF and discriminator alignment. Standard 115 volts AC, 50 to 400 Hz power or a 12 volt DC source may be used to operate the FM-9E. For portable use, a 13.5 volt alkaline battery is recommended. *Gertsch-Singer Instrumentation. Circle 104 on Reader Service Coupon.*



Data Terminal

The Lynch B313 PCM wideband data terminal provides accurate high speed data (0 to 256 kilobits per second) and voice transmission over exchange type telephone cables. The B313 PCM wideband data terminal transmits serial, synchronous or asynchronous data signals from digital computers, interface data sets, facsimile equipment, high speed printers and other data processing equipment. The B313 PCM wideband data terminal is completely compatible with the Western Electric TIWB3. The Lynch data terminal can interconnect end-to-end with the WE data-voice terminal or interface between the WE "TI" terminal and the span line terminating equipment. The Lynch B310 PCM repeaters are also electrically compatible with the "TI" repeaters.

This data-voice terminal may be used on any Lynch B310 "TI" or WE "TI" PCM system in a variety of applications. The individual data modems are available in either group or supergroup configurations. The group modem is for use with data transmission rates of 0 to 64 kilobits per second. The supergroup modem is designed to operate at bit rates of 0 to 256 kilobits per second.

A B310 "TI" terminal equipped with a B313 wideband data terminal and one group modem will provide for the transmission of data at 0 to 64 kilobits per second and 21 voice circuits over one span line (two cable pair). Two group modems will provide two 0 to 64 kilobit data circuits and 18 voice circuits on one span line. Three or four group modems will provide three or four 0 to 64 kilobit data circuits and 12 voice circuits on one span line. One supergroup modem will provide one 0 to 256 kilobit data circuit and 12 voice circuits over one span line. *Lynch Communication Systems Inc. Circle 105 on Reader Service Coupon.*

Two-way Radio

The Super-Fleetfone 500 radio, which uses an all-solid-state design, is rated for continuous duty transmit. Models are available in the 150 MHz or 450 MHz bands. The continuous duty transmit rating means that excessive transmit cycles will not degrade performance or shorten the life of components. The Super-Fleetfone 500 speaker is combined with the control head to provide a single compact unit. Microphones and cables are plugged into connectors in the unit's back. A complete Super-Fleetfone 500 consists of combined master and power modules, speaker/control module, interconnecting cables, transistorized reluctance microphone, antenna, power cables with circuit breaker and mounting hardware. *RCA Commercial Electronics Systems Division. Circle 106 on Reader Service Coupon.*

Document Reader

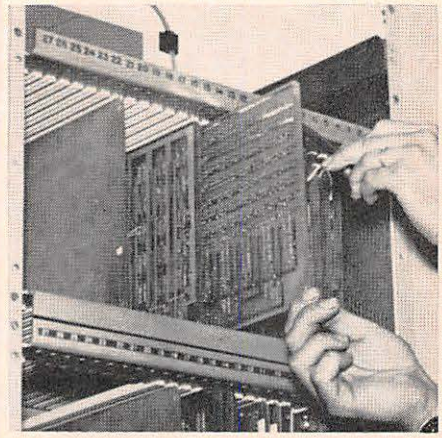
A new optical character recognition system can read large volumes of documents produced either by typewriters, high-speed line printers or embossed plate imprinters. The 935 document reader captures 1200 bits of information for every character scanned.

The Control Data 935 can read 90,000 documents an hour (or 25 documents a second). Document size may range from 2¼" by 3" to 5½" by 8½".

Two systems are the 935-1 and the 935-2. A CDC 1700 computer is used in both systems. The 935-2 systems reads one, two or three lines of both letters and numerals in the USASCS-OCR type font. It recognizes 17 punctuation marks and eight special symbols. A lister, which operates under program control is standard equipment on the 935-2. The lister logs every document as it is read, thus facilitating document and batch control and enabling the customer to make error correction and recovery in the easiest possible manner. The lister prints 16 columns on continuous folded paper. A three-pocket sort permits separation of reject documents and a two-way sort of processed material. Hoppers provide extra-large storage capacity. Like the lister, the sorting subsystem operates under program control from the 1700 computer system.

The 935-1 reads a single line of the USASCS-OCR numeric font. It features the same high reading resolution as the 935-2 for customers requiring only a single line, numeric capability.

The computer not only controls the reading system but is also used to process the captured data under a standard programing package called DRAFT, a macro-assembler. The DRAFT (Document Read and Format) package allows the customer to define input documents, to organize files and to edit and manipulate captured data prior to output. *Control Data Corp. Circle 107 on Reader Service Coupon.*



New Version ACI

A new version of the KarTrak automatic car identification system features a modular design and uses integrated circuits for greater reliability and versatility.

The new system, designated the 800 series, substitutes integrated circuits for other discrete semiconductor components used in earlier models. Ten basic circuit boards, each containing up to 48 integrated circuits, form the basic system and replace the complex wiring in earlier versions. Additional circuit boards permit rapid changes in configuration at the railroad site. The 800 series includes, as an option, a semi-automatic test set that can quickly diagnose system failures. When traced, it is estimated that 90% of all failures can be repaired by replacing a plug-in module. *Sylvania Electric Products Inc. Circle 108 on Reader Service Coupon.*

Air Conditioners

A new down-floor air conditioner specifically designed for computer rooms uses plug-in modular humidity and temperature controls that are solid state for automatic and precise environmental regulation. The new unit controls air temperature to 72 deg

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Hand-thrown or remote-controlled

Hayes ALL-STEEL DERAILS

physically protect the main line

Derails or signals? Each has its place: signals are obeyed by men; Hayes Derails are obeyed by equipment.

When signals are not involved, the Hayes Derail alone is competent to keep the main track clear.

In modern signal systems, the Hayes Sliding Derail with DeLectric® Operator under remote control provides complete protection.

The "calculated risk" of omitting derails may be costly. Hayes Derail protection is inexpensive.

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Free leatherette ring-binder catalog of world's most-specified derails, bumping posts and wheel stops (including periodic supplement sheets). Write on letterhead.

Track safety devices that WORK at the job.

Hayes Track Appliance Co.

RICHMOND, INDIANA 47374

Circle 20 on reader service card on page 38

GROUPEMENT DE SIGNALISATION FERROVIAIRE

J-M-S

194, AVENUE PRESIDENT WILSON
93 - LA PLAINE St-DENIS
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JEUMONT-SCHNEIDER MORS SAXBY

Automatic block system
C.T.C. and remote control
Tokenless block
"All relay" interlockings
Points and signal machines
Safety relays
Electronic track circuits
Level crossing equipment
Automation in marshalling yards
Retarders
Mechanical
electromechanical
and electronic operation of
all safety and
signalling equipment.

publiscope

Circle 21 on reader service card on page 38

PRODUCT NEWS

(Continued from page 36)

±2 deg and relative humidity to 45 ±5%.

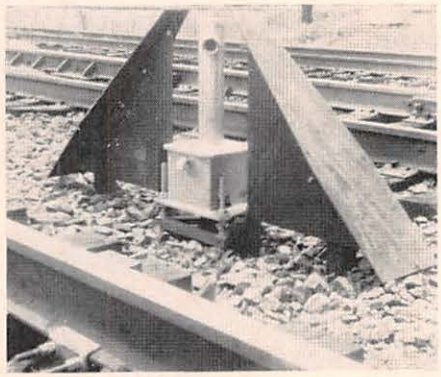
To provide for assured continuity of service, all major components are doubled —two hermetically sealed compressors, two water-cooled condensers, and dual electrical and protective devices. In the unlikely event that a unit fails, the air conditioner can continue to operate at half capacity indefinitely or until the defective unit is repaired or replaced.

A solid-state proportional sequence step controller maintains room temperature. Two stages of cooling and two stages of heating are accurately switched so that the air conditioner responds to return air temperature variations of one-half degree or less.

Humidity is maintained by a solid-state control circuit and sensor with two independently adjustable set points corresponding to high and low humidity limits. A unique method of humidification ensures that conditioned air never leaves the unit at a relative humidity higher than 80%. (Above that, moisture will condense and cause corrosion over computer system components.) Only 80% of the returning air goes through the cooling coil. The remaining 20% is bypassed through a foam material filled with cotton flocking which absorbs water during humidification. The air picks up the moisture, mixes with the dehumidified air from the cooling coil, and passes down through the floor. As the water rushes in, it also washes the foam material.

Air flow in the new unit is down, then underneath the raised flooring of the computer room. There it is distributed upward through the computer consoles and floor grills. The air that has been passed through the computer returns through the room to the top of the unit and goes through a one-inch prefilter where large dirt or paper particles are trapped. Then it passes through a 12" deep final filter that removes 85% of all particle contamination. From there the air goes to the cooling coil (except for the 20% which bypasses and is humidified, then remixed). Mixed air enters the centrifugal blowers which pump it down through a plenum chamber where it is electrically reheated if necessary. The air then leaves the plenum and is distributed again under the floor.

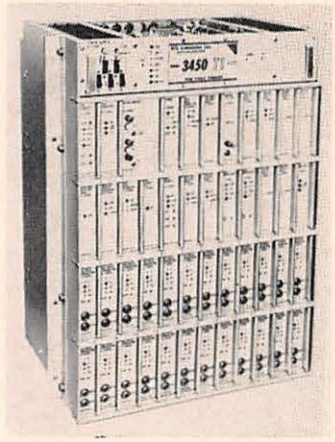
Models UK90, UK120, and UK180 are rated at 7.5, 10, and 15 tons, respectively. Lengths of the three units are 57", 75", 99", all units are 34.5" wide by 77.5" high. *Westinghouse Electric Corp. Circle 109 on Reader Service Coupon.*



Detector Protector

A new detector-deflector performs the double task of protecting hotbox detector standards from flailing chains and broken banding and, at the same time, impactor accelerometer units mounted under the sloping panels detect impacts from such anomolies, marking the location of the event on the hotbox detector recording. Associated alarm panel has facilities for actuating existing railroad signaling circuits and therefore affords hazard protection in any type of signaling territory. *Railtron Corp. Circle 110 on Reader Service Coupon.*

● DATA DISPLAY: The Sanders 720 data display system is described in bulletin BT 193A. This display oriented system employs ASCII message format and communication control characters. For internal communications and at the in-put, out-put interface, a communications buffer has been developed for use with this system when it is to be combined with the IBM 360 computer systems. *Sanders Associates Inc. Circle 111 on Reader Service Coupon.*



Cable Carrier

A new pulse code modulation cable carrier, the TI, is specifically designed to be fully compatible with the Western Electric "TI" carrier and is designated model 3450. Pulse code modulation techniques are used to carry a total of 24 duplex toll quality circuits with various optional standard type signaling modes, over two telephone cable pairs. The RFL "TI" PCM type carrier system uses time-division multiplexing. A complete 24 channel terminal, including power supply, occupies 24½" of standard 19" rack space. Included in each terminal are 24 channel units. Each channel unit includes built-in signaling. Optional modules enable E&M, one-way loop dial, revertive pulsing or foreign exchange type signaling. *RFL Industries Inc. Circle 112 on Reader Service Coupon.*

● ANTENNAS: Descriptions, photographs and electrical specifications of hy-gain two-way radio antennas is provided in a ten-page brochure. Mobile antennas described, operate in the 25-50 mHz, 130-174 mHz and 450-470 mHz frequency bands. Base station antennas included in the catalog operate 25-50 mHz and 144-174 mHz frequency bands. *Hy-Gain Electronics Corp. Circle 113 on Reader Service Coupon.*

● TELEVISION: The Porta-Pack video tape recording system and its associated playback combination equipment is described in a 4-page brochure GEA-8654. The hand held camera weighs about 4 lb and its companion, the video tape recorder, carried in a shoulder-pack, weighs about 10 lb. *General Electric Co. Circle 114 on Reader Service Coupon.*

● CLEANING UNITS: How to evaluate sonic energy cleaning equipment is discussed in bulletin 101. Included is a description of the equipment, how it operates, its advantages as well as how the manufacturer's application and engineering service can help the customer make a survey to determine his sonic energy cleaning requirements. *Bendix Instruments & Life Support Div. Circle 115 on Reader Service Coupon.*

RAILWAY SIGNALING & COMMUNICATIONS
14 E. Jackson Blvd., Chicago, Ill. 60604
Attn: R. W. McKnight Reader Service Card 3/69

Circle numbers for more information about products and services.

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ADDRESS .....
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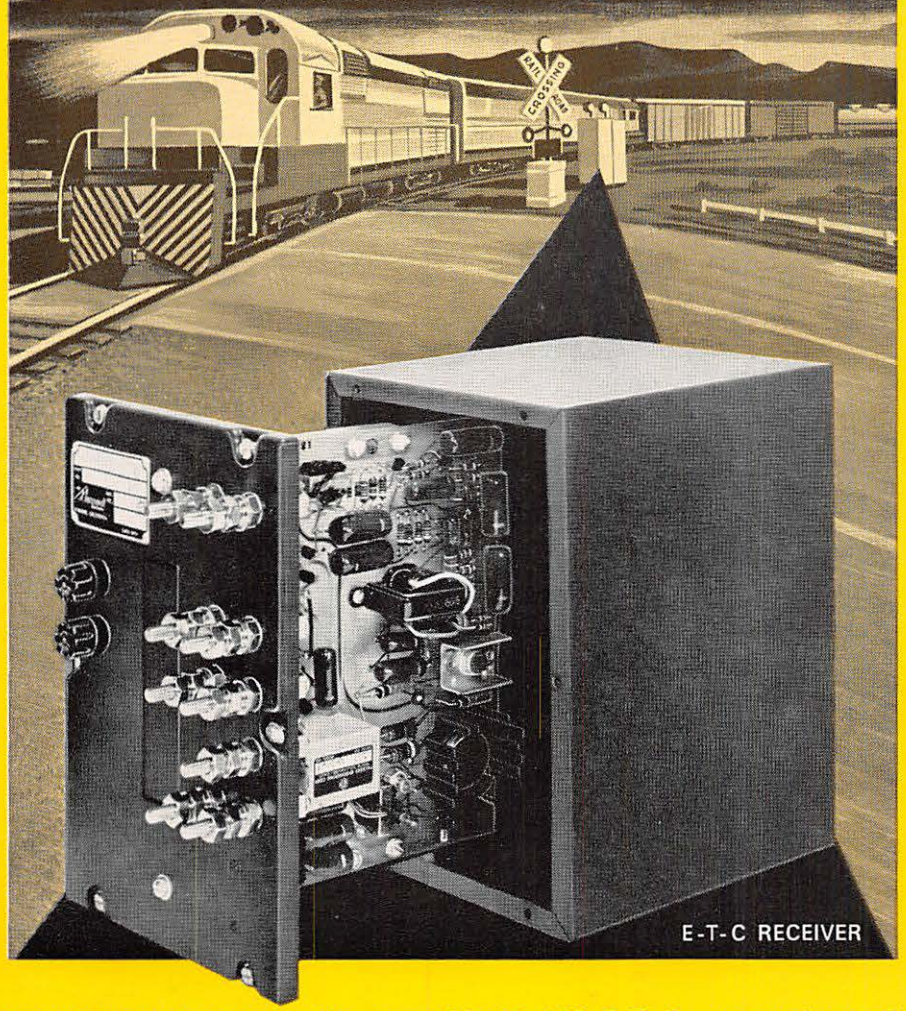
THIS COUPON MUST BE USED ON OR BEFORE MAY 31, 1969

from Marquardt Industrial Products

THE NEW LOW-COST MODEL 100 E-T-C



E-T-C RECEIVER

MARQUARDT INTRODUCES the new Model 100 E-T-C...a product of advanced electronic engineering technology for improved, low-cost overlay track circuit applications. ■ Marquardt's Electronic-Track-Circuit system...with records of proven reliability and fail-safe operation in more than 500 installations—is now available in a *new design at lower cost, with improved operational and maintenance features.*

MEET THE NEW MODEL 100 E-T-C

- *Burial shunt requirements eliminated!*
- *Power consumption significantly reduced!*
- *Remote transmitter operable from primary batteries!*
- *Operating band expanded to 11 frequencies!*
- *Simplified modular transmitter and receiver packaging for ease of installation and maintenance!*
- *Shunting characteristics improved!*

Also ask your Marquardt representative about the new Modulated Electronic Track Circuit (METC) for use in A.C. coded cab territories and the new EMETC for use on electrified railroads.

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TO SERVE
THE RAILROAD INDUSTRY

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- *Electronic Track Circuits (ETC)*
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- *Constant Voltage Rectifiers*

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4320 West Montrose Avenue
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- *Communications Consoles, Voice Paging Systems, Loud-speakers, Related Components*
- *Radio Control Equipment, Solid State Amplifiers, Remote Line Test Units, Power Supply Systems*

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National Sound Services, Ltd.
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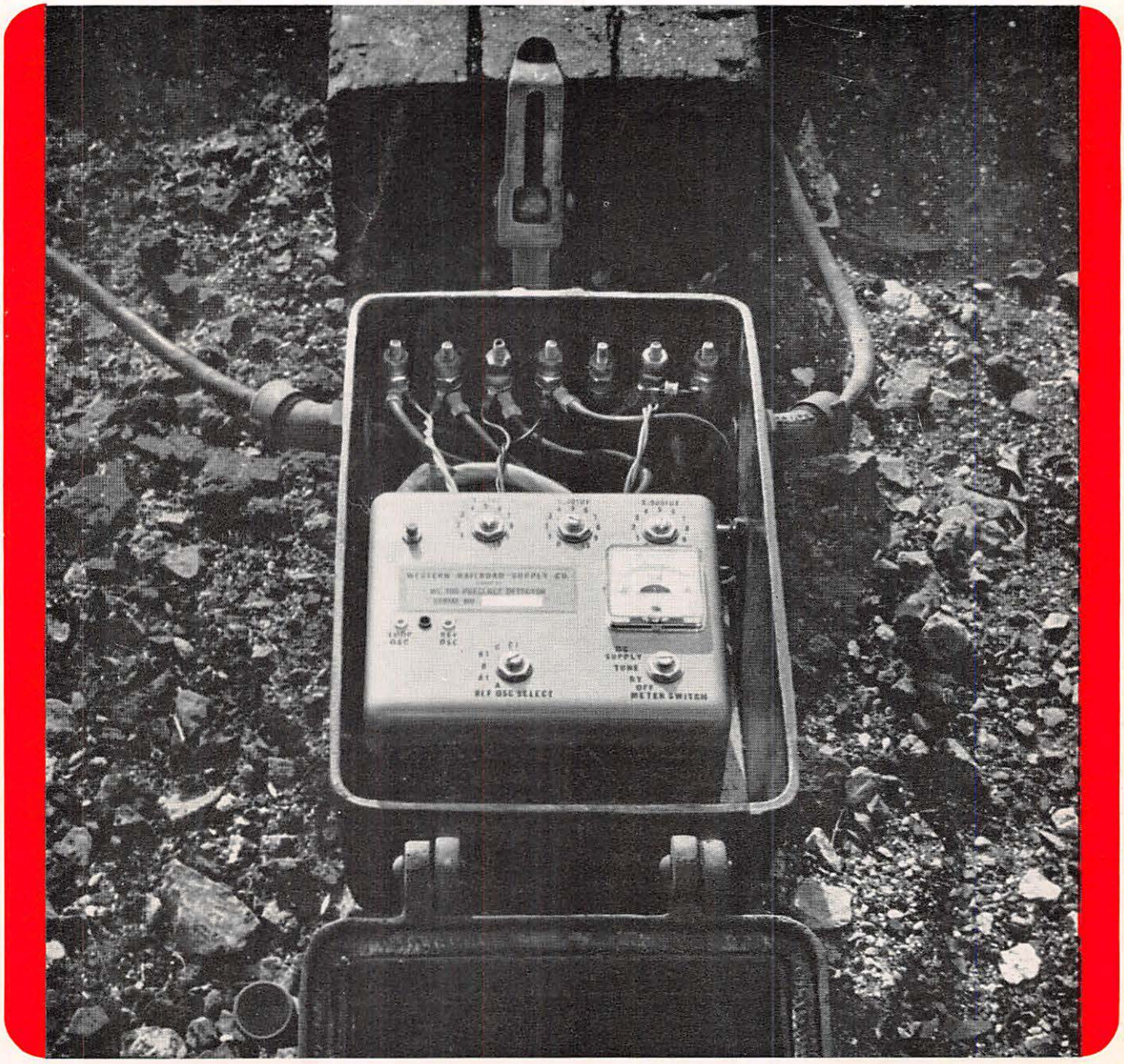
RPI
RAILWAY PROGRESS INSTITUTE

MARQUARDT INDUSTRIAL PRODUCTS CO.

Circle 2 on reader service card on page 38

The Problem Solver:
For Switching Extra-Length, Extra-Height* Cars

WESTERN-CULLEN
WC-100 PRESENCE DETECTOR



It's all there on the face of it: integrated, complete control, lightning protected, and fail-safe. All you need do is provide the insulated wire loop, power supply and install. It's totally efficient and backed by ample warranty. In effect the WC-100 gives you freight car detection for switching operation at its best!

* Distance from top of rail to underside of car.

Engineering details available from:

WC WESTERN-CULLEN DIVISION
FEDERAL SIGN AND SIGNAL CORPORATION
2700 West 36th Place · Chicago, Illinois 60632
Canada: Woodings Canada, Ltd., 5 Place Ville Marie, Montreal 2, Que.

3118

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